PRECISION STRIKE ASSOCIATION

Precision Strike PEO
Summer Forum
"Joint Perspectives on Precision Engagement"

July 10-11, 2007
Virginia Beach Resort Hotel
2800 Shore Drive
Virginia Beach, VA 23451

Presision Strike Summer Forum 2007 Agenda

TUESDAY, 10 JULY 2007

"*Joint Testing In A Virtual And Live Environment", Colonel Eileen Bjorkman,* USAF—Test Director, Joint Test Evaluation Methodology, Office of the Director of Operational Test & Evaluation (DOT&E), OSD

"Army Precision Engagement", Mr. Allan Resnick —Director of Requirements Integration, U.S. Army Training and Doctrine Command

"Armed Unmanned Systems: A Perspective On Navy Needs, Challenges And Vision", Rear Admiral T. Heely, USN—Program Executive Officer for Strike Weapons and Unmanned Aviation (PEO (W))

"Precision Weapons From The OSD Perspective", Captain Peter Murphy, USN—Office of the Under Secretary of Defense (AT&L), Portfolio Systems Acquisition (Air Warfare)

WEDNESDAY, 11 JULY 2007

"Keynote Address: Joint Perspective On Precision Engagement", Major General "Mike" Hostage III, USAF— Director for Requirements and Integration (J8), U.S. Joint Forces Command

The U.S. Army's Precision Strike Weapons, Developing Systems And Lessons Learned
- *Mr. James Sutton*—U.S. Army, Deputy Program Executive Officer, Ammunition, Picatinny Arsenal
- *Mr. Sam Coffman*—Director Futures Center, Fort Sill

"State Of Precision Engagement In The U.S Air Force", Major General David Clary, USAF—Vice Commander Air Combat Command (ACC), Langley Air Force Base

"Air Force Precision Strike Weapons Development Status," Colonel Richard Justice, USAF—Commander of the Miniature Munitions Systems Group (MMSG), Eglin Air Force Base

"Unmanned Systems (UAS) Roadmap", Dyke Weatherington—Deputy, UAS Planning Task Force, Office of the Under Secretary of Defense (AT&L), OSD

Joint Test and Evaluation Methodology (JTEM) Overview: Precision Strike Testing in a Joint Environment

10 July 2007

Colonel Eileen Bjorkman
Joint Test Director
(757) 638-6099
eileen.bjorkman@jte.osd.mil

Overview

- Background
- JTEM Test Concept
- Capability Test Methodology
- Joint Mission Environment Definition
- Assembling the Joint Mission Environment
- FY07 Test Event w/ Precision Munitions
- JTEM Products

Background: Testing in a Joint Environment Roadmap

Transformation Planning Guidance

- Joint "concept-centric" approach for capability development
- Integrated architectures define parameters of joint capabilities
- Need to test capabilities and architectures in a realistic joint environment

Signed April 2003

Strategic Planning Guidance

- Need realistic T&E in a joint operational context
- Directed DOT&E to develop a roadmap to identify changes necessary to ensure T&E is conducted in a joint environment to enhance fielding of joint capabilities

Signed March 2004

Testing in a Joint Environment Roadmap

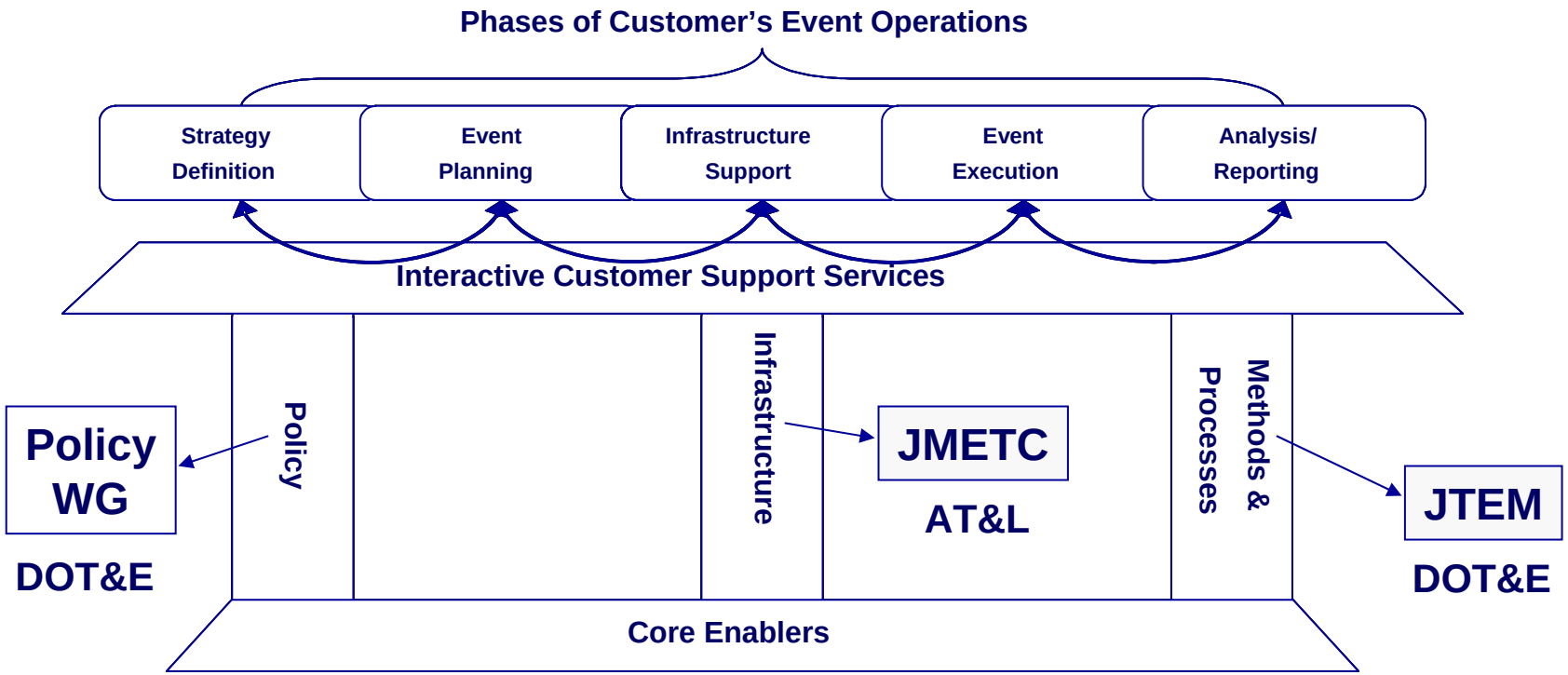
- Build Joint Mission Environment from mission requirements defined by JCIDS
- Required for entire acquisition process, not additional test
- Defines infrastructure required:
  - -- Network connectivity
  - -- Service environments
  - -- Program-specific

Signed November 2004

Recognized need for T&E Transformation

DOT&E – Director of Operational Test and Evaluation
JCIDS – Joint Capabilities Integration and Development System
T&E – Test and Evaluation

Background: JTEM Role in the Roadmap Implementation



Methods & Processes Working Group Issues delineated in Implementation Plan form basis for JTEM methodology

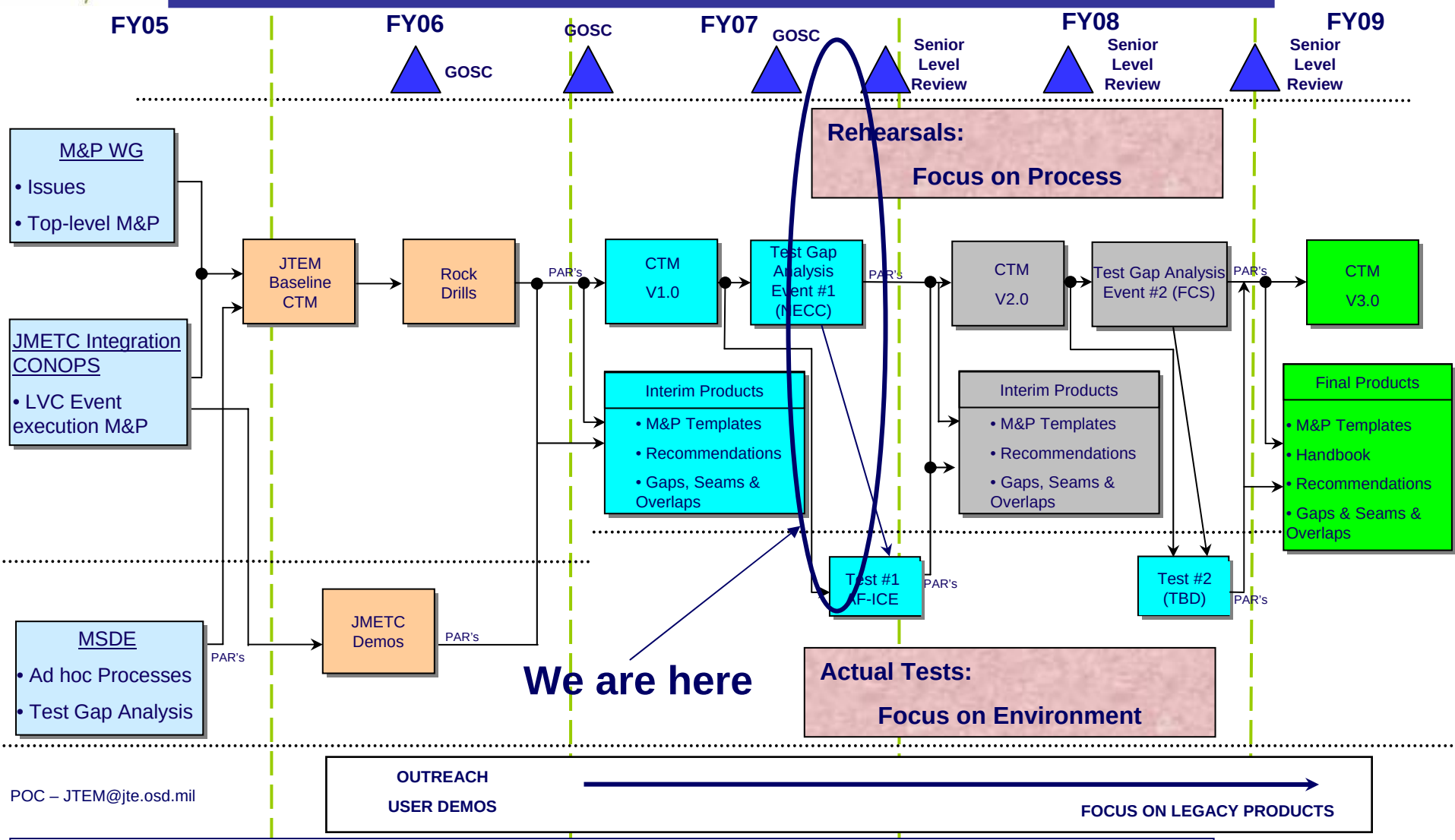
AT&L – Acquisition Technology and Logistics
JMETC – Joint Mission Environment Test Capability
DOT&E – Director of Operational Test and Evaluation
WG – Working Group

Background: JTEM Problem Statement

Processes and methods for designing and executing tests of system of systems in the joint mission environment are not well defined or understood. Nor is there a clear understanding of how to assess system performance as it pertains to capabilities supporting joint missions.

Overall Goal: Recommended Best Practices for a consistent approach to describing, building, and using an appropriate representation of a particular Joint Mission Environment across the acquisition lifecycle.

JTEM Test Concept



POC – JTEM@jte.osd.mil

AF-ICE - Air Force Integrated Collaborative Environment **CONOPS -** Concept of Operations **CTM** - Capability Test Methodology **FCS** - Future Combat System **GOSC** - General Officers Steering Committee **JMETC** - Joint Mission Environment Test Capability **LVC** – Live, Virtual, Constructive **M&P WG** - Methods and Processes Working Group **MSDE** - Multi-Service Distributed Event **NECC** - Net-Enabled Command & Control **PAR** - Process Anomaly Report

JTEM Capability Test Methodology (CTM) v1.1

6 Steps
14 JTEM Processes

0. Develop T&E Strategy

- T&E Strategy (TES)
- T&E Master Plan (TEMP)

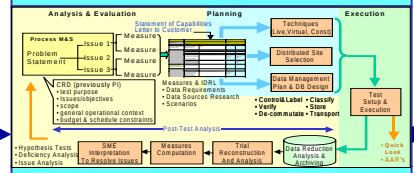
- Develop Capability/SoS Description
- Develop Joint Operational Context for Test (JOC-T)
- Develop Evaluation Strategy Outline
- Develop/Refine Capability Crosswalk

1. Characterize Test

- Program Introduction Document (PID)
- Statement Of Capabilities (SOC)

- Develop Test Concept
- Develop Evaluation Strategy
- Technical Assessment

2. Plan Test



- Develop Test Design
- Perform LVC Distributed Environment Analysis
- Develop Test Plan

3. Implement LVC Distributed Env.

- Design LVC Distributed Environment Configuration
- Integrate LVC Distributed Environment

4. Execute Test

5. Evaluate Test

- Analyze Data
- Evaluate SoS Performance & Joint Mission Effectiveness

Test Concept

Joint Operational Context for Test

Test Data

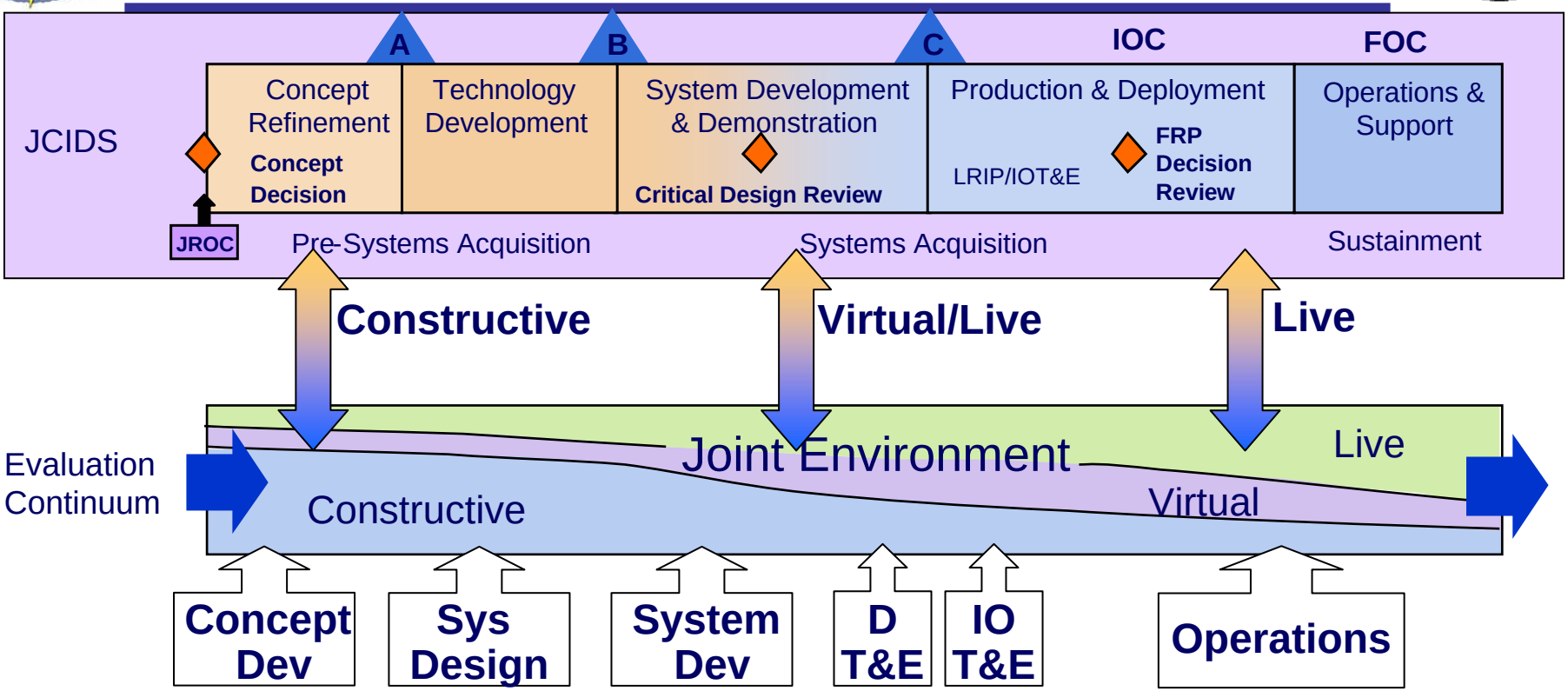
Integrated Vignettes LVC Distributed Environment Design

Joint Mission Environment

Test Control & Monitoring

LVC – Live, Virtual, Constructive
SoS – System of Systems

Joint Mission Environment (JME) Definition



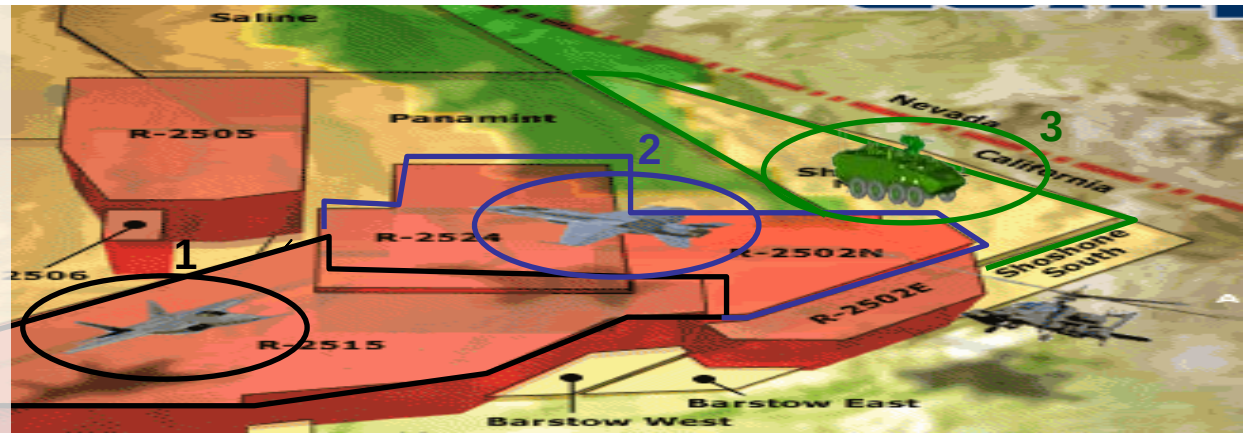
Scenarios	**Terrain**
Threat systems	**Weather**
Blue forces	**Propagation effects**
Order of battle	**Logistics**
TTP/Doctrine	

Instrumentation
Time-Space-Position Information
Test/event control
Data reduction/analysis tools

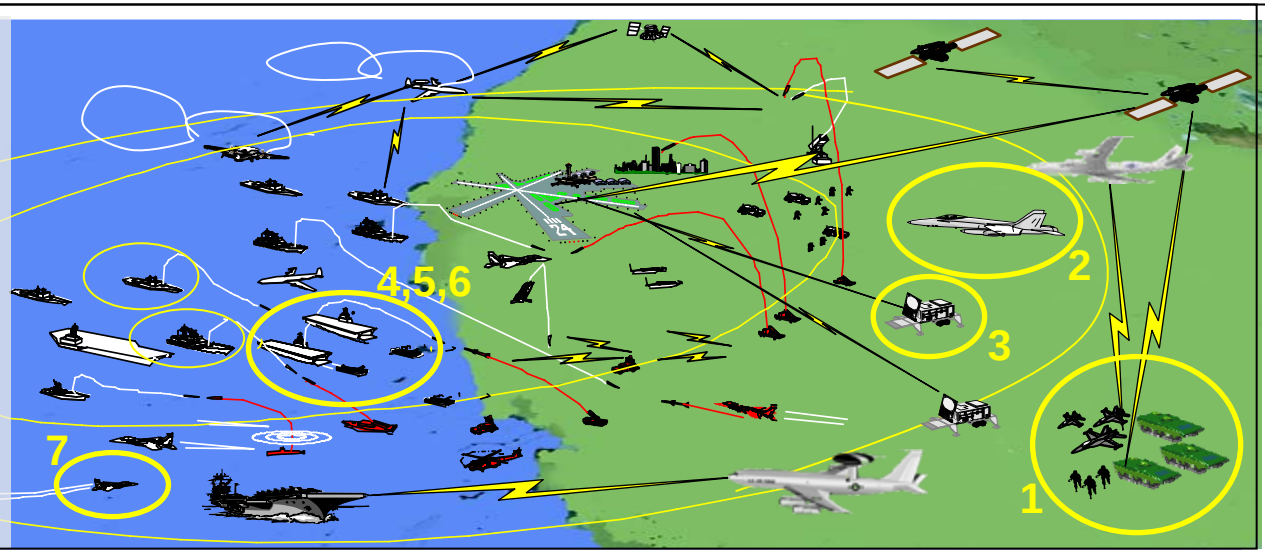
DT&E – Development Test and Evaluation **FRP –** Full Rate Production **IOT&E –** Initial Operational Test and Evaluation **LRIP –** Low Rate Initial Production **JCIDS –** Joint Capabilities Integration and Development System **JROC –** Joint Requirements Oversight Council **TTP –** Tactics, Techniques, and Procedures **T&E –** Test and Evaluation

JME Definition: Physical vs. Logical Test Range

A physical test range has pre-existing infrastructure, configured so multiple systems under test (SUTs) can independently conduct live test missions simultaneously, usually geographically separated.



A "logical" test range is a LVC-DE with pre-existing LVC infrastructure, configured so multiple SUTs or SoS under test can independently conduct test missions simultaneously, separated by their JME.



SUT 1 – JCAS
SUT 2 – SEAD (EF-18G)
SUT 3 – DCA (Patriot PAC-3)
SUT 4 – Maritime Propositioning Force
SUT 5 – Ship Self Defense System
SUT 6 – CSAR (MV-22)
SUT 7 – OCA (F-35)

Assembling the JME

OSD/J7

J8/J7/
"Capability Lead"

J7/JFCOM

AT&L/
Service/Joint Acq Programs

JTEM

JMETC

Components

Analytic Agenda
DPS, MSFD, FYAB

JOpsC Family
JOC, JFC, JIC

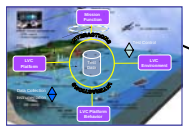
JCIDS
JCD, ICD, CDD, JCIDS DoDAF Views (e.g., OVs, SVs)

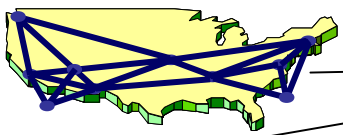
AOA

JCAs

UJTL

TES/TEMP
STAR





Joint Operational Context for Test (JOC-T)
Mission
Blue
Disparate
Environment
Interactions
JOC-T DoDAF Views

Live Virtual Constructive Distributed Environment (LVC-DE)
JME Foundation Model (JFM)
JME DoDAF Views
Models,
Middleware, Infrastructure

JME instantiated for a capability test execution

USN/MC Co
Sea Environmer
Air Componer
Surface Compor
Subsurface Comp
CONOPS
Link Models
C2/ISR
Space

AF-ICE CORE
USAF Air Componen
USAF C2/ISR
USAF Weapor
USAF Link Mo
USAF CONO
IADS Tools
Space

Threat Systems
NASIC, MSIC, ATSO, NGIC, etc…

USA 3CE CORE
USA Ground Environm
USA BMC2
USA Platforms
USA CONOPS
USA Link Models
USA Air Components
USA Weapons

Common CORE Tools
InterTEC
Stealth Viewer

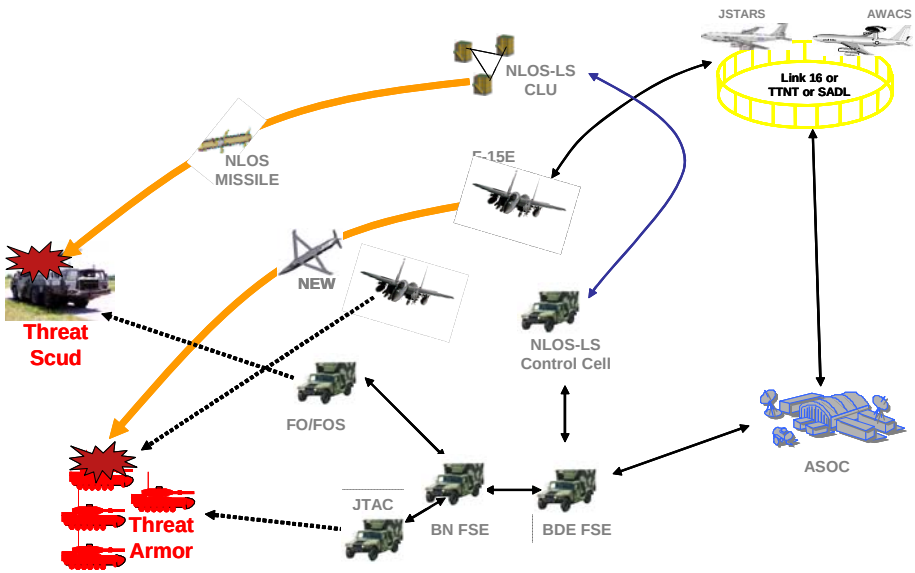
Common Joint CORE
FDCE
JSIC
JITC

FY07 Test Event: Precision Munitions Use Case

- **Joint Missions**
  - **Joint Close Air Support**
  - **Joint Fires**

Event Execution:
6-10 August 2007

- **Participating Systems**
  - **Network-Enabled Weapon**
  - **Non Line-of-Sight Launch System with Precision Attack Missiles**



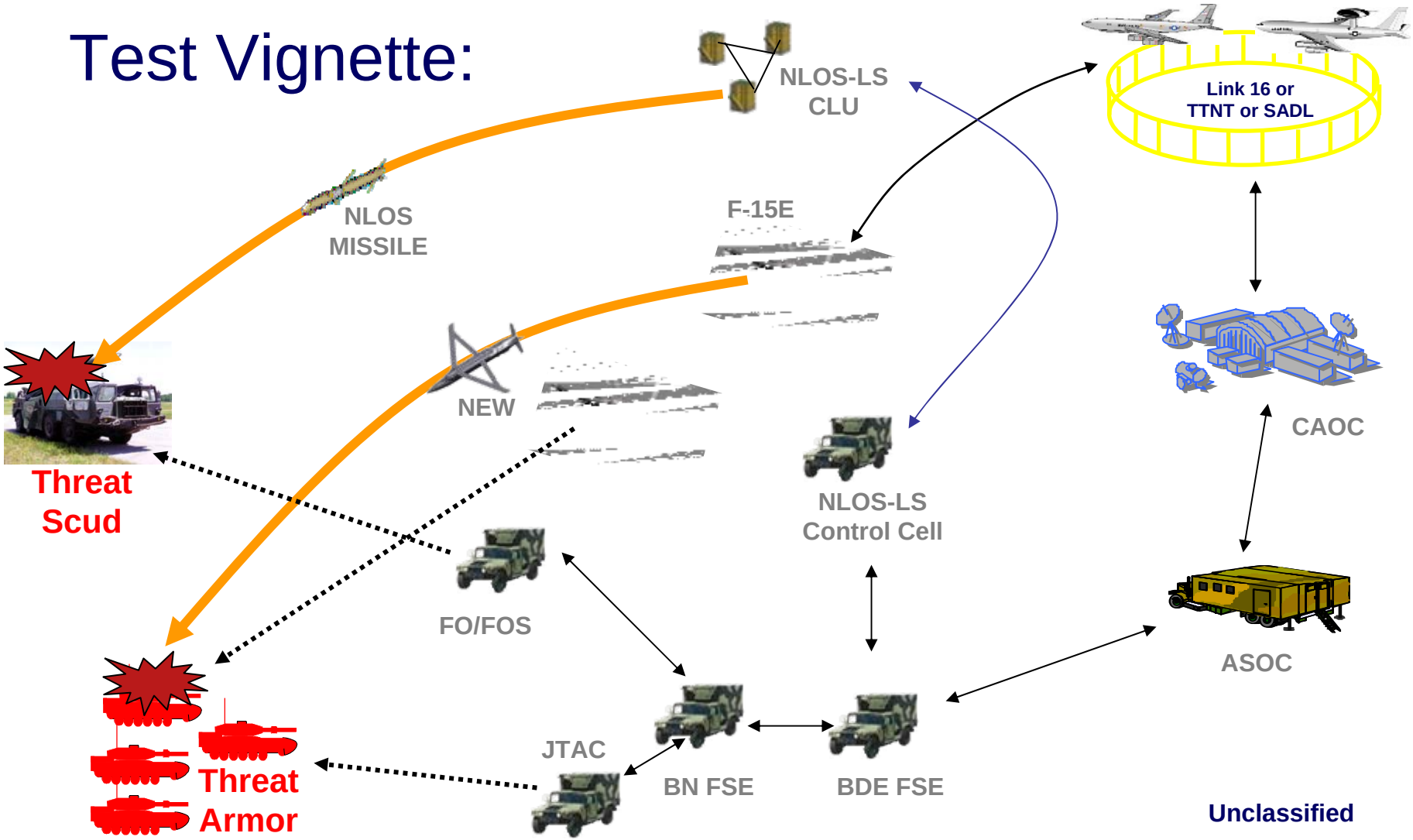
<u>Test Activity</u>: Testing in an Joint Environment during Development Test and Evaluation

<u>Overall Test Goal</u>: Use contributions to joint mission effectiveness to determine which of the tested weapon design and Joint TTP alternatives warrant further development.

ASOC – Air Support Operations Center **AWACS** – Airborne Warning and Control System **BDE –** Brigade **BN** – Battalion **CLU** – Container Launch Unit **FO** – Forward Observer **FOS** – Forward Observer Software/System **FSE** – Fire Support Element **JSTARS** – Joint Surveillance Target Attack Radar System **JTAC** – Joint Terminal Attack Controller **SADL** – Situation Awareness Data Link **TTP** – Tactics, Techniques, and Procedures **TTNT** – Tactical Targeting Network Technology

FY07 Test Event: Precision Munitions Use Case

Test Vignette:



Unclassified

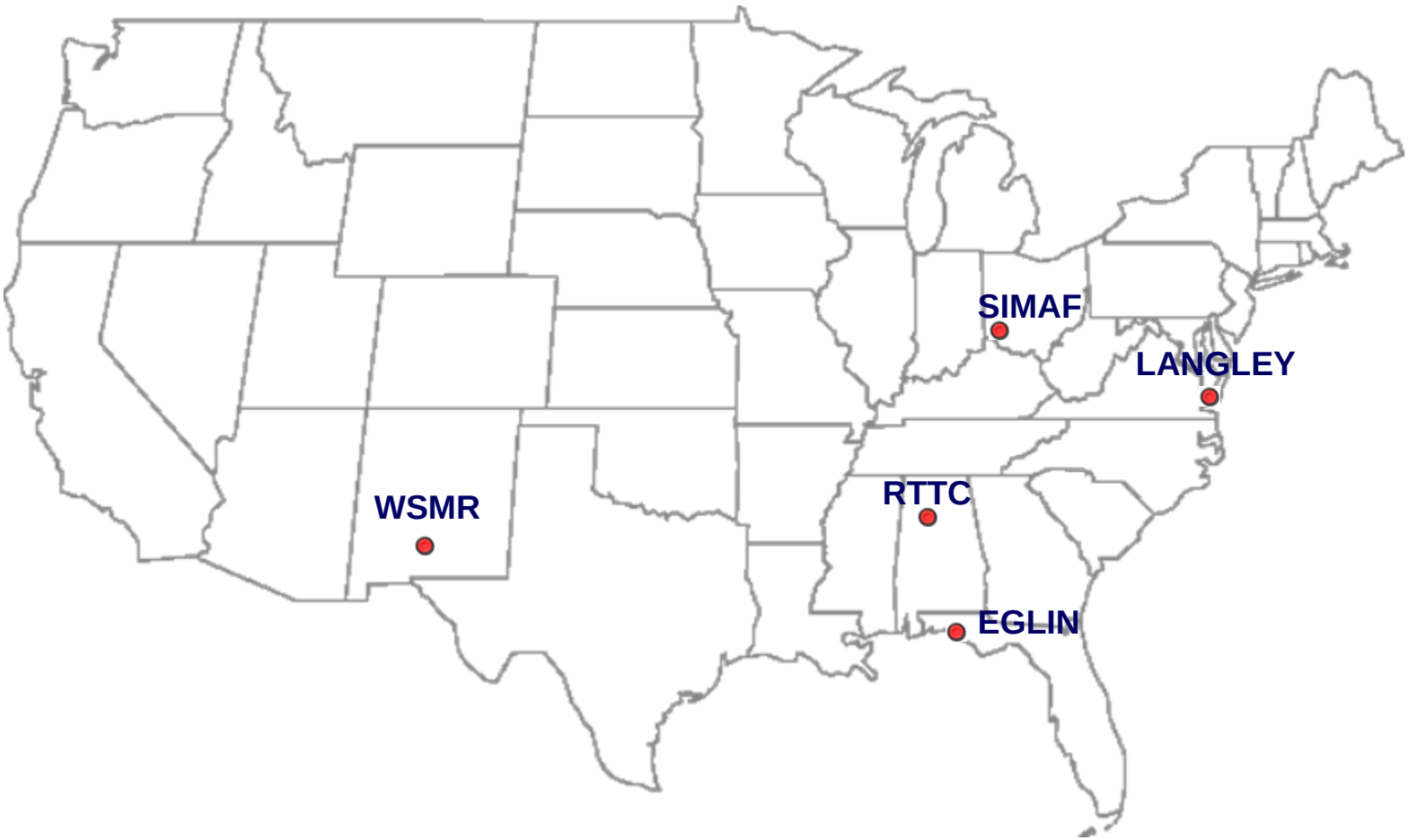
ASOC – Air Support Operations Center **AWACS** – Airborne Warning and Control System **BDE –** Brigade **BN** – Battalion **CLU** – Container Launch Unit **FO** – Forward Observer **FOS** – Forward Observer Software/System **FSE** – Fire Support Element **JSTARS** – Joint Surveillance Target Attack Radar System **JTAC** – Joint Terminal Attack Controller **SADL** – Situation Awareness Data Link **TTP** – Tactics, Techniques, and Procedures **TTNT** – Tactical Targeting Network Technology

Precision Munitions Use Case: Test Objectives

- **Determine the ability to perform the NEW handoff function over Link-16.**
- **Determine the impact of airspace deconfliction on attack timelines when NEW and NLOS systems are employed in potentially conflicting situations that require the generation of an ACMR.**
- **Evaluate Guidance Message continuity after successful NEW handoff.**

ACMR – Airspace Control Measure Request **NEW –** Net-Enabled Weapon
NLOS – Non-Line of Sight

Precision Munitions Use Case: Distributed Test Environment



RTTC – Redstone Technical Test Center **SIMAF –** Simulation and Analysis Facility **WSMR –** White Sand Missile Range

Precision Munitions Use Case: Distributed Test Configurations

Function	Primary Configuration	Backup Configuration
JTAC	WSMR (Constructive)	Eglin (Live)
NEW	SIMAF (Constructive)	Eglin (Constructive)
Launch Aircraft	SIMAF (Virtual)	Eglin (Virtual)
Targets	WSMR (Live)	SIMAF (Constructive)
CAOC	Langley (Virtual)	Langley (Virtual)
NLOS-LS	RTTC (Constructive)	RTTC (Constructive)

CAOC – Combined Air Operations Center **NEW –** Net-Enabled Weapon **NLOS-LS –** Non-Line of Sight Launch System **JTAC** – Joint Terminal Attack Controller **RTTC** – Redstone Technical Test Center **SIMAF** – Simulation and Analysis Facility **WSMR** – White Sands Missile Range

JTEM Products Overview

Capability Test Methodology (CTM) Process Model

CTM Ontology:
- Capability Evaluation Metamodel
- JTEM Lexicon

JTEM Process Anomaly Report DB

Type 1

M&P TEMPLATES:
- PID/SOC
- Test Plan
- SDD
- JFM
- JCER:

Joint Testing Checklists

Transitions to JCIDS/DOT&E

Type 2

Handbooks for Test & Acquisition Community:
- CTM PM/Capability Manager Handbook
- CTM Action Officer Handbook
- JMe Analysis Guidebook

Transitions to DOT&E

Type 3

Recommended Changes to Acq. Instructions & Directives:

Supplements or Changes to DAU T&E Management Guide

Transitions to AT&L and/or DOT&E

Type 4 → **Transitions to** → **Type 1, 2, 3 Products and other Joint Environment COI Organizations**

GAPS, SEAMS, & OVERLAPS:
- Input Issues (M&P WG, MSDE, CTTRA)
- Rock Drill, Gap Analysis, Test Event Issues & Watch List Findings
- Process Anomaly Reports (PARs) with associated actions

AT&L – Acquisition Technology and Logistics **COI** – Community of Interest **CTM –** Capability Test Methodology **CTTRA -** Common Test & Training Range Architecture **DAU** – Defense Acquisition University **DB** – Database **JCER –** Joint Capabilities Evaluation Report **JCIDS** – Joint Capability Integration and Development System **JFM -** Joint Mission Environment Foundation Model **JOC -** Statement of Capability **JMe -** Joint Mission Effectiveness **M&P WG -** Methods and Processes Working Group **MSDE -** Multi-Service Distributed Event **PAR** – Process Anomaly Report **PID -** Program Introduction Document **PM** – Program Manager **SDD -** System Design Document **SOC** – Statement of Capability


JOINT
TEST AND EVALUATION


JOINT TEST & EVALUATION METHODOLOGY
INVESTIGATE + DEMONSTRATE + INCULCATE

QUESTIONS?

Army Strike Concept and Lessons Learned in Employing Precision Munitions

Sam Coffman

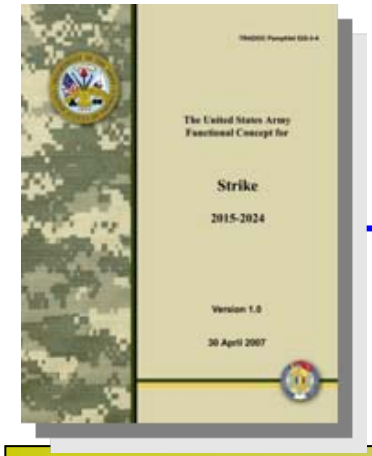
Director, Futures Development Integration Center

U. S. Army Field Artillery Center, Fort Sill, OK

Agenda

- Overview of Army's Strike Concept
- Some lessons learned in using Field Artillery precision munitions in current combat operations

What is "Strike"



"Strike consists of the employment of future Modular Force fires, including available joint and multi-national fires, in support of full spectrum operations and the integration of fires with information capabilities and operations such as Command and Control Warfare, Information Engagement, and military deception operations."

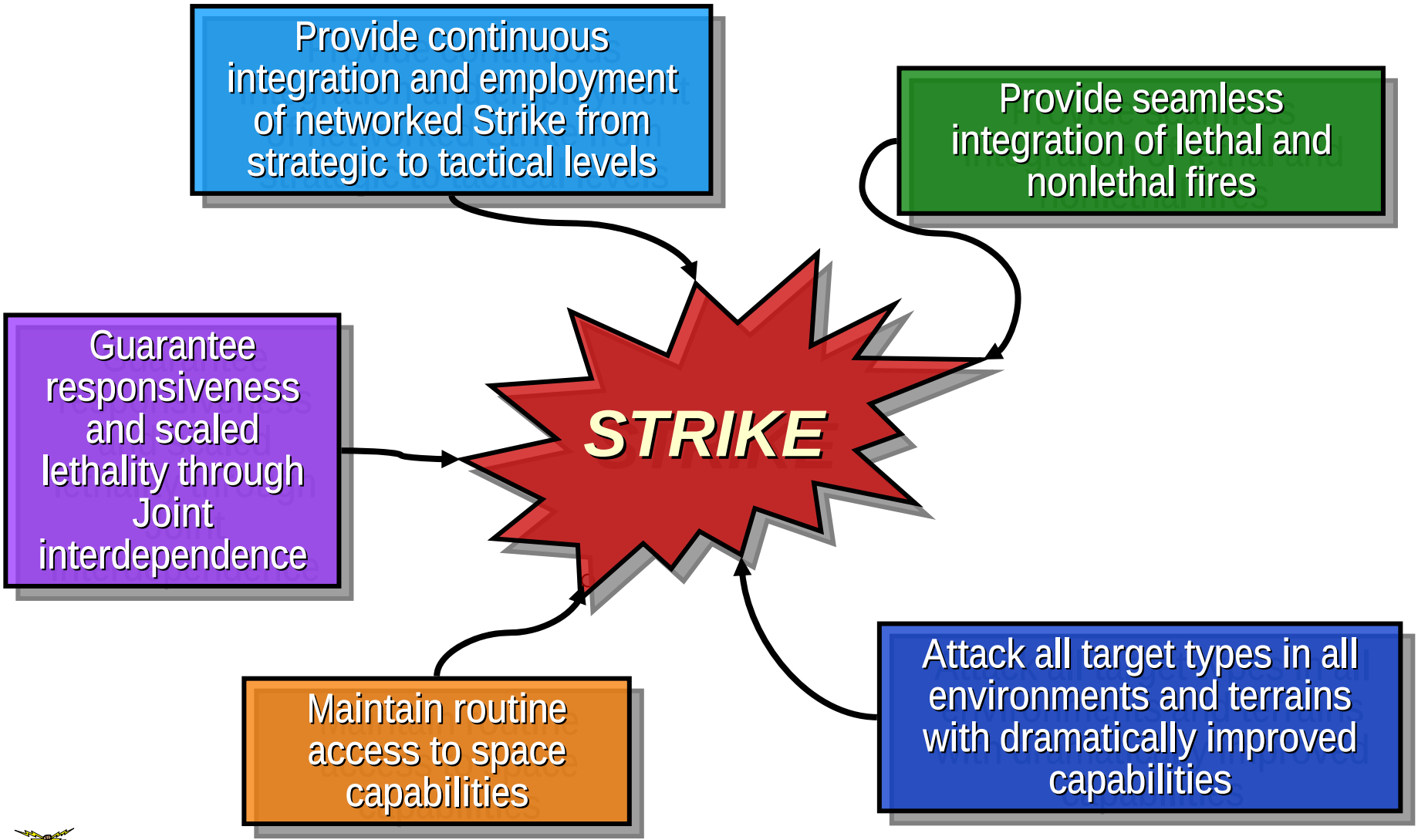
TRADOC Pam 525-3-4

Taking Fires to the Next Level

TODAY	2015-2024
• Synergy of lethal and non-lethal fires in its infancy	• Fully nested application of Strike at all levels—horizontal and vertical
• Emerging capability to engage targets in urban/COIN environments	• Fires and Information "synergy"
• Multiple challenges in coordinating in a JIIM environment	• Dramatically improved responsiveness, effectiveness and efficiency
	• Enhanced complementary and reinforcing effects

ARMY CENTRIC → JOINT RESPONSE → GURANTEED RESPONSE WITH BEST EFFECTS

Key Conceptual Ideas



Networked Strike

Fully automated sensor fusion

Network imbedded precision target location capability

Cooperative and responsive target engagement

Key Idea:

Provide continuous integration of networked Strike from strategic to tactical levels

Required Enablers

- Network that supports collaborative and dynamic planning and employment across all levels of command
- Continuous access to the Common Operational Picture (COP)
- Seamless and transparent communications and computer interfaces
- Routine employment of available joint and multinational fires

Result:

Fully nested application of Strike at all levels to achieve a common purpose

Pervasive situational awareness

Real time integration of fires with BSOs

Routine tracking and classification of friendly, enemy and neutral personnel and BSOs

Lethal and Nonlethal

Advanced antipersonnel, anti-materiel, and terrain denial capabilities

Mix lethal and nonlethal capabilities based on possible consequences

Influence civilian populations and world opinion

Key Idea:

Provide seamless integration of lethal and nonlethal fires

Required Enablers

- Synergistic integration of fires with information capabilities and operations
- Expansion of nonlethal means and capabilities

Result:

Synergy resulting from the integration of fires and information

Standardized effects generation tools

Alter munition effects from lethal to non-lethal after firing / launch

Enhanced Capabilities

Balance lethality with collateral damage

Access sensors from strategic to tactical levels

Accurately locate and identify concealed or disguised objects

Key Idea:

Result:

Required Enablers

- Employment of advanced munitions
- Near real time situational awareness
- Delivery of immediate and sustained precision fires

Attack all target types in all environments and terrains with unprecedented effectiveness

Exploitation of near real time situational awareness to dramatically enhanced responsiveness, effectiveness and efficiency

Real time, interactive munitions capable of scalable effects

Most advantageous mix of sensors and effectors

Systems that eliminate the consequences of response gaps

Guarantee Responsiveness

Common procedures and control measures

Interoperable capability to spot, mark, tag, and designate targets

Reciprocal visibility and access to assets and capabilities

Key Idea:

Guarantee responsiveness and scaled lethality through Joint interdependence

Required Enablers

- Identification of the requirements for reciprocal joint support of lethal and nonlethal Strike
- A fully interoperable and seamless fires network at all levels

Result:

Enhanced complementary and reinforcing effects with reduced vulnerabilities

Common grid reference system

Standardized certification, education, and training

Common suite of joint decision-making tools

Routine Access to Space

NOAA weather data

NSA products and data

National reconnaissance assets

Key Idea:

Maintain routine access to space capabilities

Required Enablers

- Incorporation of space related interagency capabilities
- "Operational responsive space" as the new model for space access
- Space capabilities throughout all levels of command

Result:

Commanders at all levels have near real time situational awareness, integrated fires, C2, and knowledge

Shared SA to individual level

Advanced missile warning

Precision guidance capabilities

Summary

These key ideas

- Provide continuous integration and employment of networked strike from strategic to tactical levels
- Provide seamless integration of lethal and nonlethal fires
- Attack all target types in all environments and terrains with unprecedented effectiveness
- Guarantee responsiveness and scaled lethality through Joint interdependence
- Maintain routine access to space capabilities

With the required enablers

ENABLERS

Will lead to . . .

- Fully nested application of Strike at all levels
- Synergistic integration of fires and information
- Dramatically improved responsiveness, effectiveness and efficiency
- Near real time situational awareness, integrated fires C2, and knowledge
- Enhanced complementary and reinforcing effects
- Reduced vulnerabilities

Lessons Learned

- Need direct and indirect capabilities for precision targeting at BCT level and below
  - Excalibur LUT proves we have direct capability that meets the need
  - PSS-SOF is great but has limitations that constrain its full utility
  - Scene matching will take PSS-SOF to another level for more dynamic targeting
- Precision in altitude is just as important as the other dimensions of target location
- Excalibur Ballistic Impact Points (BIPs) should be based on the AFATDS solution initially, then refined based on imagery and then selected based on observer final refinements.
- Troops in Contact missions have generally been more responsive than preplanned missions
- GMLRS-Unitary has broken a dated paradigm on use of rockets in close support

Lessons Learned

- Having munitions that render themselves inert is great but needs to be adjustable to the situation
- GPS situational awareness is critical to ensure units are aware when satellites are taken offline as well as satellites broadcasting unhealthy information
- Differences in the Earth Geoids Models used by targeting folks, our sensors, C2 systems, and weapons platforms will be a continuing challenge we must address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Back Up Slides

Expectations for Fires 2015-2024

- Future commanders will have teams of artillery, air defense artillery, IED, sensor, signal, and electronic and computer subject matter experts who can provide the required support for the complex strike network of the future.
  - This will include the capability to deliver point and loitering jammers and surveillance for both air and ground systems for targets.
- Exchanges of friendly complex strike networks against enemy complex strike networks will replace the current friendly/enemy exchanges of artillery fire.
- Systems will be incorporated into integrated strike networks to provide future commanders capabilities to habitually conduct offensive, defensive, and exploitation strike operations.

The end result will be synergistic combinations of systems, decision-makers, and capabilities that enable commanders to employ fires integrated with C2W, IE, and MILDEC operations with unprecedented responsiveness and precision.

Armed Unmanned Systems

A Perspective on Navy Needs, Initiatives and Vision

Rear Admiral Tim Heely, USN
Program Executive Officer
Strike Weapons and Unmanned Aviation
10 July 2007

NAVAIR

Armed UASs

A first time for everything

Sperry Unmanned Aerial Torpedo Attack Aircraft
Circa 1918

Armed UAS Roles & Missions

PROVIDE

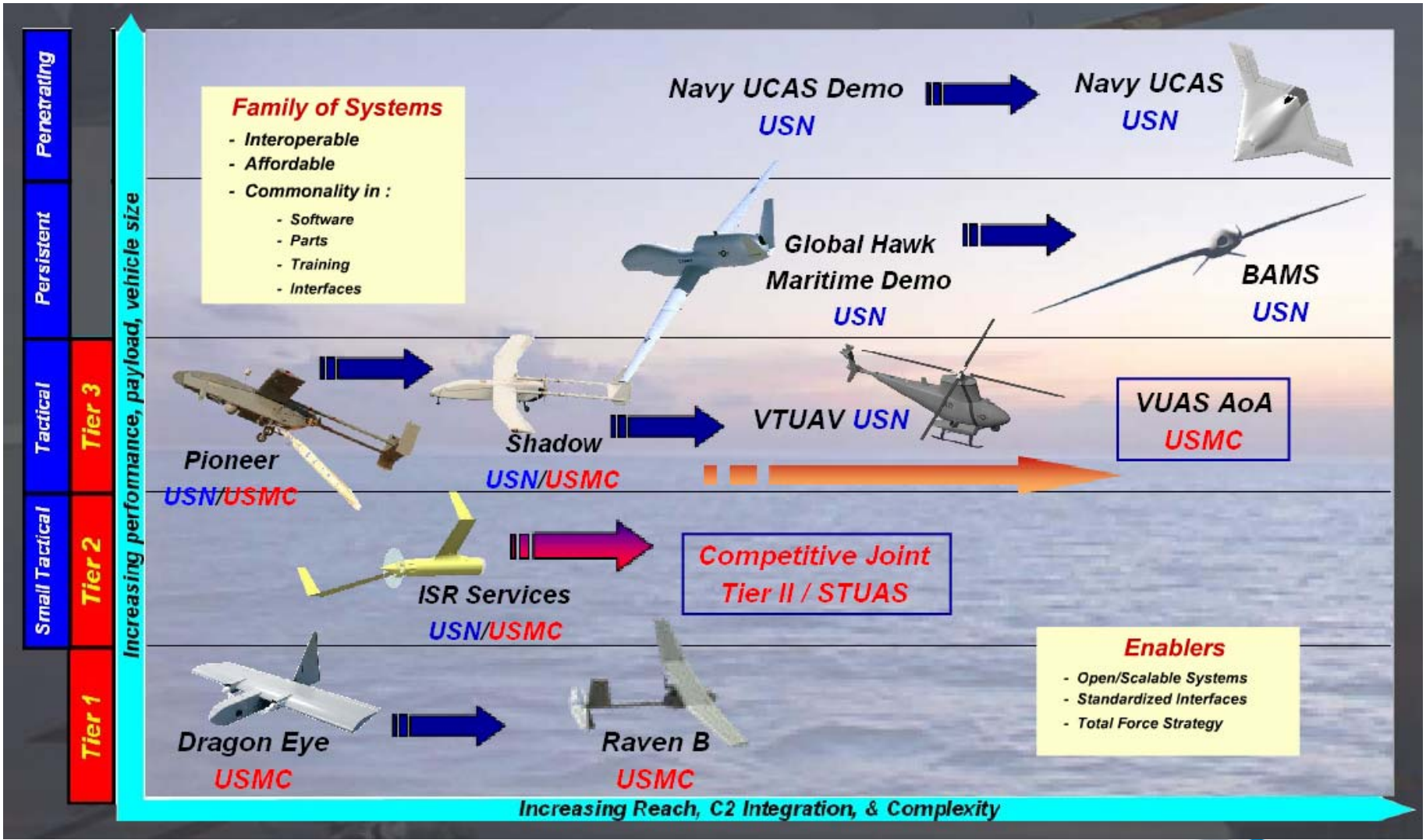
- ISR
- PRE-PLANNED ATTACK
- TGTS OF OPPORTUNITY
- SEAD
- BDA
- RE-ATTACK
- SPECIALIZED FUNCTIONS

AGAINST

- MOBILE TARGETS
- PROTECTED TGTS
- CHEM BIO SITES
- UNPROTECTED DISBURSED TGTS
- DEFENSIVE TGTS
- MARITIME TGTS
- TIME CRITICAL TGTS

Success Will Require a Broad Array of Platforms, Sensors and Weapons

Navy UAS
Family of Systems

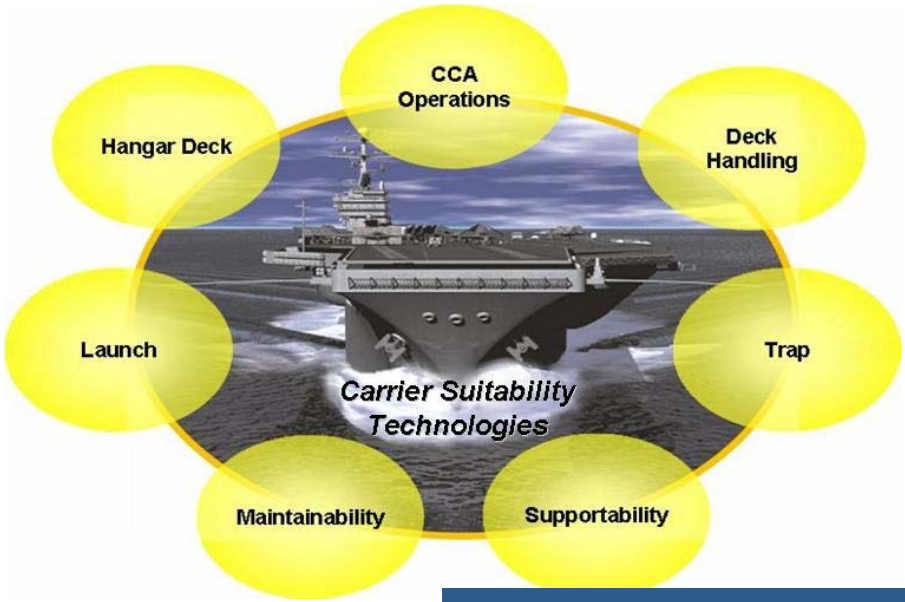


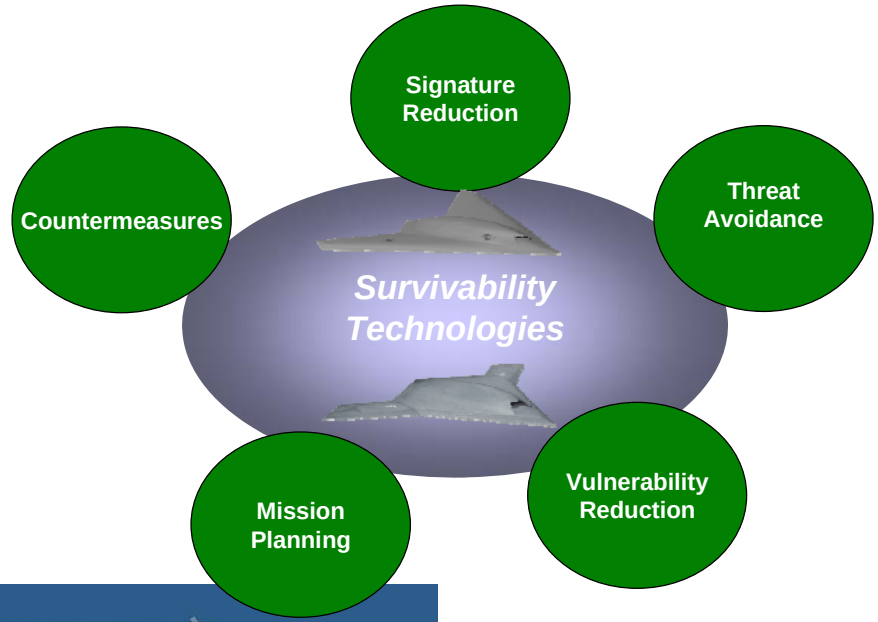
Navy UCAS Objective

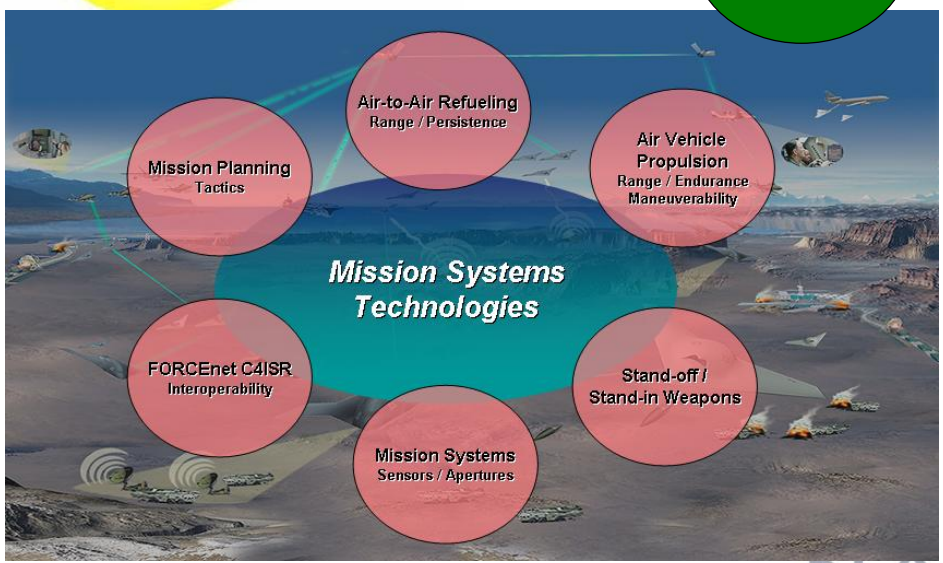
- Navy UCAS Program matures technologies which supports entry into SDD for a Persistent, Penetrating, Carrier-based Strike ISR platform.
  - Leverages past DARPA, USAF, and USN J-UCAS efforts
  - Funded for Navy UCAS CV Demonstration (also called UCAS-D)

- Near-Term Program Goals:
  - Demonstrate Carrier Suitability of Persistent ISR Relevant, Unmanned, LO-Planform Air Vehicle

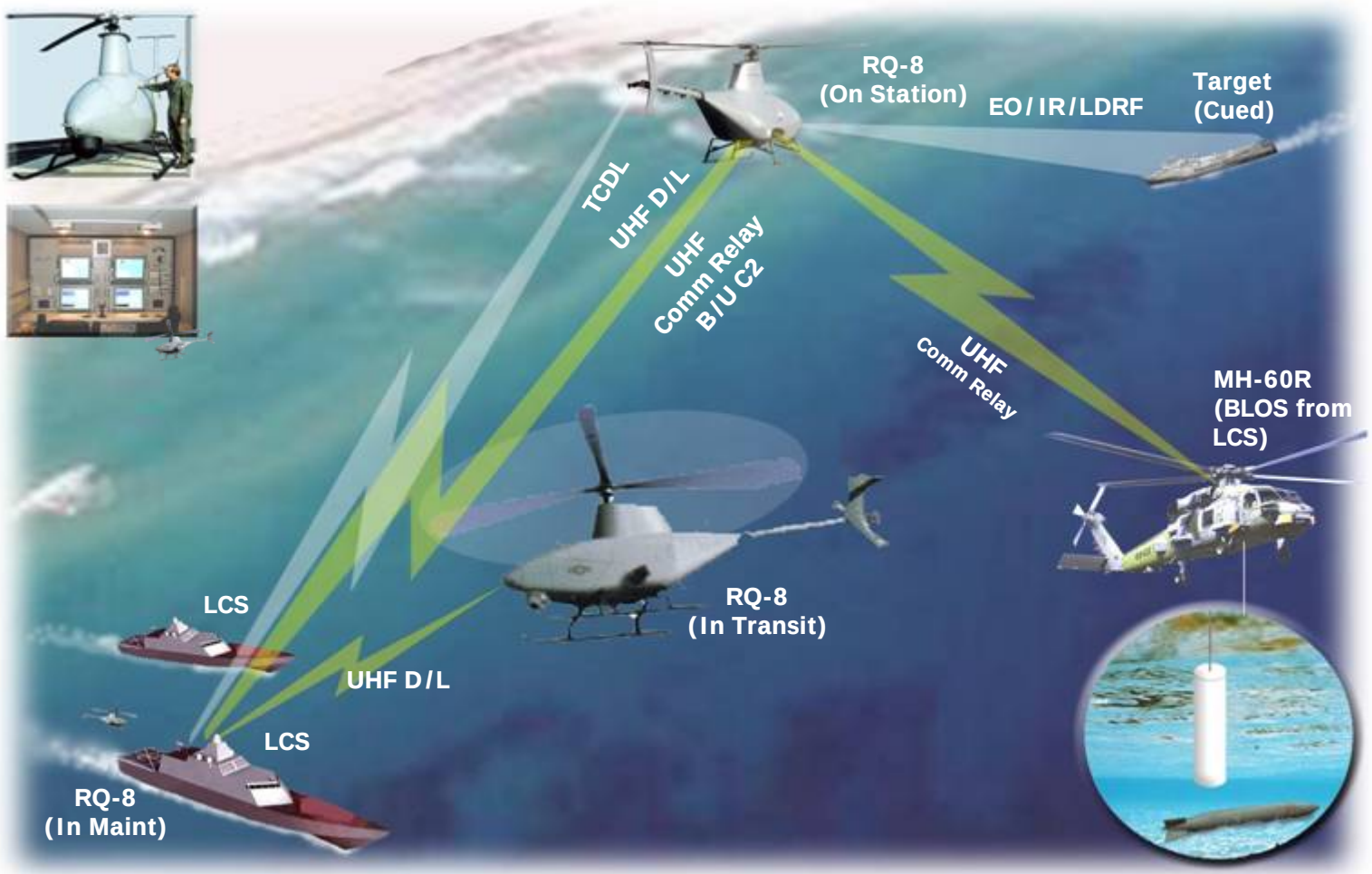
N-UCAS Technology Focus Areas







VTUAV System Overview



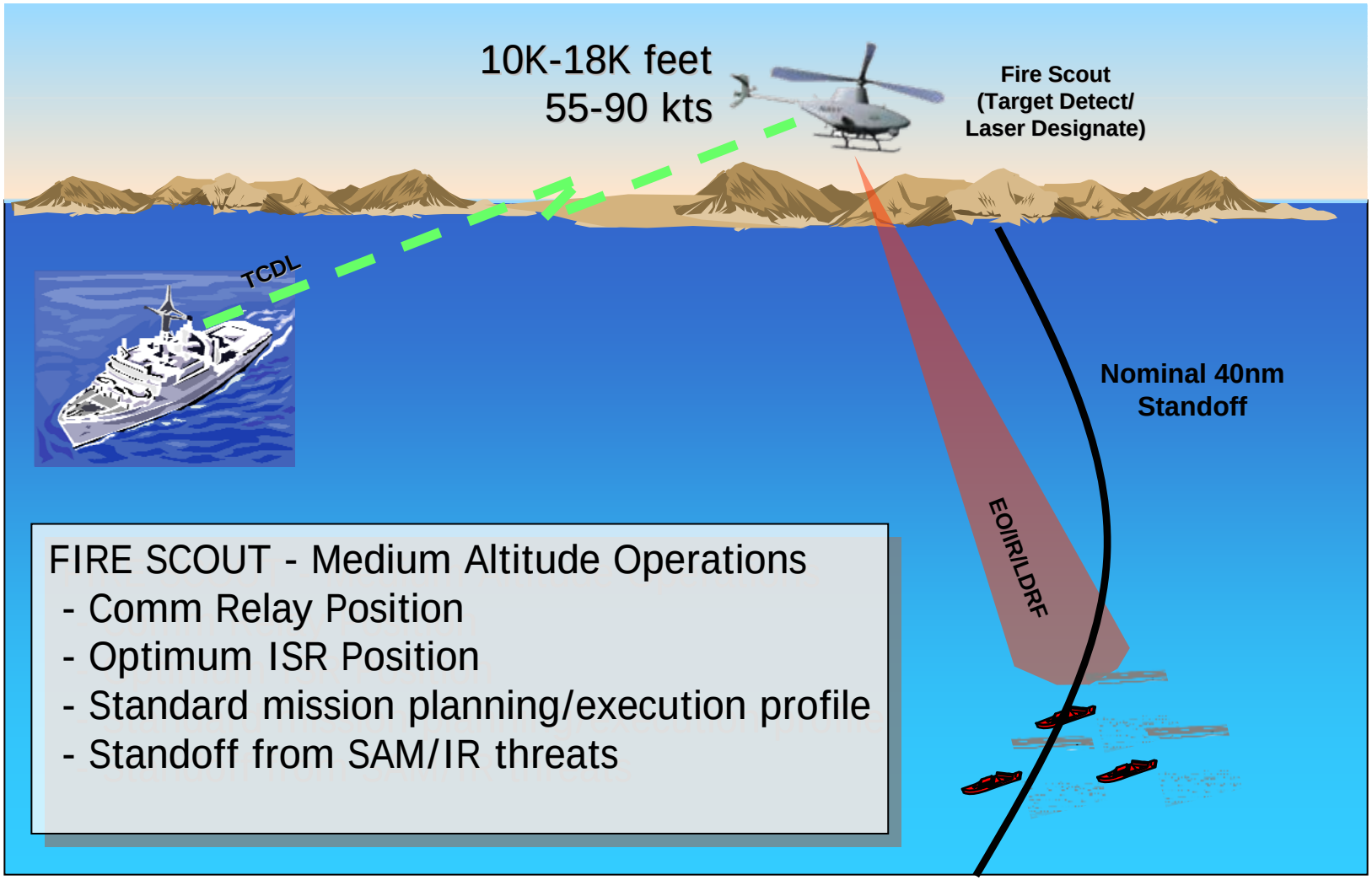
Fire Scout
Primary Mission

- Primary operational mode is Reconnaissance, Surveillance & Tracking.
  - Detect, Identify, Report, & Designate suspected threats
  - Avoid surface threats engagement envelope
- Neutralize time critical threats with on-board weapons while maintaining safe standoff distance.
  - Significant reduction in LCS “kill chain” if threat is engaged at maximum range.
- Threats from Ground based IR/Radar SAMs
  - Drives VTUAV operational altitude
  - Increased standoff necessary

MQ-8B Capabilities and First Flight

	MQ-8B
Horsepower	340
Gross Weight, lb Sea Level w/ 200FPM climb rate	3150
Payload, lb	600
Max Fuel Load, gal	190
Mission Radius, nm (200 lb Payload, 3 hr TOS)	205
Maximum TOS, hr (200 lb Payload, 110 nm Radius)	>5.6
Maximum TOS, hr (600 lb (Payload + Weapons), 110 nm Radius)	2.2
Max Speed, ktas (MGW at SL and 10,000 ft PA)	112 / 93
Survivability Improvements	Significant IR & acoustic improvements
Supportability Improvements	Significant
Payload Volume, cu. ft.	26
Plug and Play	Yes
Weapons Capable	Yes
STANAG 4586	Yes

Fire Scout
Conceptual Weapons Engagement



Potential Target Set

- Fast Attack Craft
  - Ships
  - 40mm to 76mm guns, SAMs, torpedoes and ASCM
- Fast Inshore Attack Craft
  - Smaller, more maneuverable patrol boats, drones, suicide craft
  - 7.62mm, 12.7mm, Shoulder Launched Missiles
  - Loaded w/Explosives
- Derived from:
  - LCS CONOPS
  - LCS Threat Assessment
  - In-theater Inventory

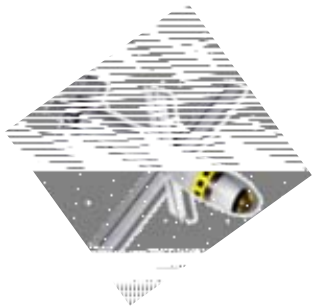
Live Fire Demonstration – Yuma Proving Grounds

Fire Scout Weapons Study
Initial Weapons Selection Criteria

- Weapon Weight < 250lbs
  - Weight of weapon is a tradeoff with usable fuel which equates to range/time on station
  - Low cost/sufficiently lethal weapons typically lightweight
- Precision Guidance or Projectiles
- Warhead applicable to Fast Attack Craft threat
- In Production or Final Stage Development
- Practical on UAV Platform
  - Delivery method
  - Sensor integration
  - Ship board operations/certification

FIRE SCOUT
Weapons Recommendations

Smart Bombs most conducive to Fire Scout mission



Fire and Forget Missiles good match when developed

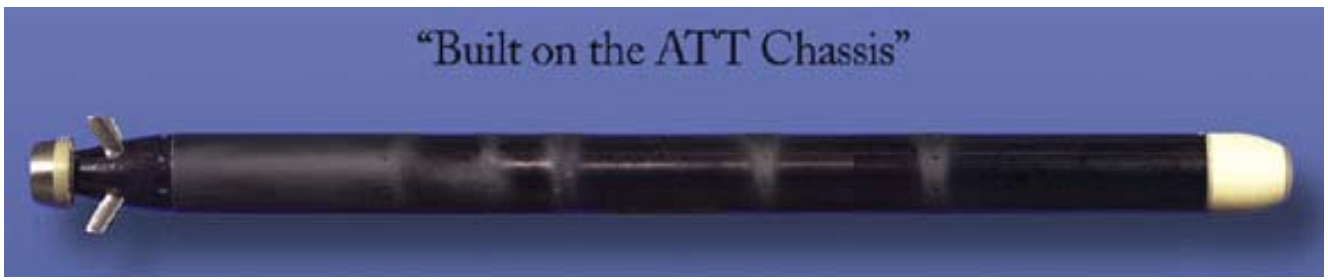
Viper Strike
- Laser guided
- $65k per Unit
- Used on Army Hunter UAV in Iraq
- Manufacturer: Northrop Grumman

PGMM
- Laser Guided – no moving parts
- $15k per unit
- Army precision mortar program
- Manufacturer: ATK

LOGIR/APKWS
- Inertial/IIR/Laser guidance
- $10K to $15K per unit
- China Lake Effort on 2.75” rocket
- Manufacturer: TBD

Other Potential Weapons Efforts

- **Compact Rapid Attack Weapon (CRAW)** – Compact (~85” length, 6.75” diameter, <220lb) weapon capable of being deployed from remotely operated unmanned platforms (VTUAV, USV) against submarines.
  - Builds on successful completion of Anti-Torpedo Torpedo
  - Requires Magnetometer equipped VTUAV
  - ONR/N76 lead for ACTD



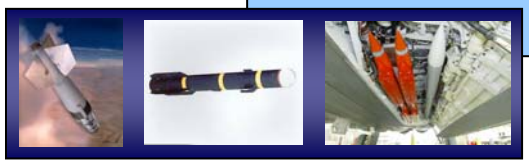
- **China Lake SPIKE** – CNO level interest in SPIKE employed on VTUAV.
  - Supports LCS Layered Defense concept
  - Developmental weapon, light weight
    - China Lake lead for ACTD

Armed UAVs
Part of a Larger Mission Force

Other Manned Aviation

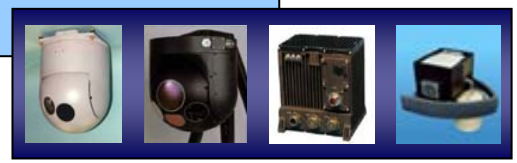
Other UAVs

Vehicles



Weapons

Data Link



Payloads

Data Link

Other Surface Nodes

GCS

Some Armed UAV Challenges

- Architecture & Standards
  - Ground Stations
  - Payload
  - Weapons
- Flexible “Payload” Areas
- Shipboard Operations
- HSI Emphasis and Consistency
- Vehicle Survivability
- Adaptive Control and Collaborative Operations
- CONOPS and Demonstrations
- Integration with Mission Forces

Joint Command and Control Capability Portfolio Management (JC2 CPM)

Transforming the Force to Efficiently and Effectively Execute Precision Engagement

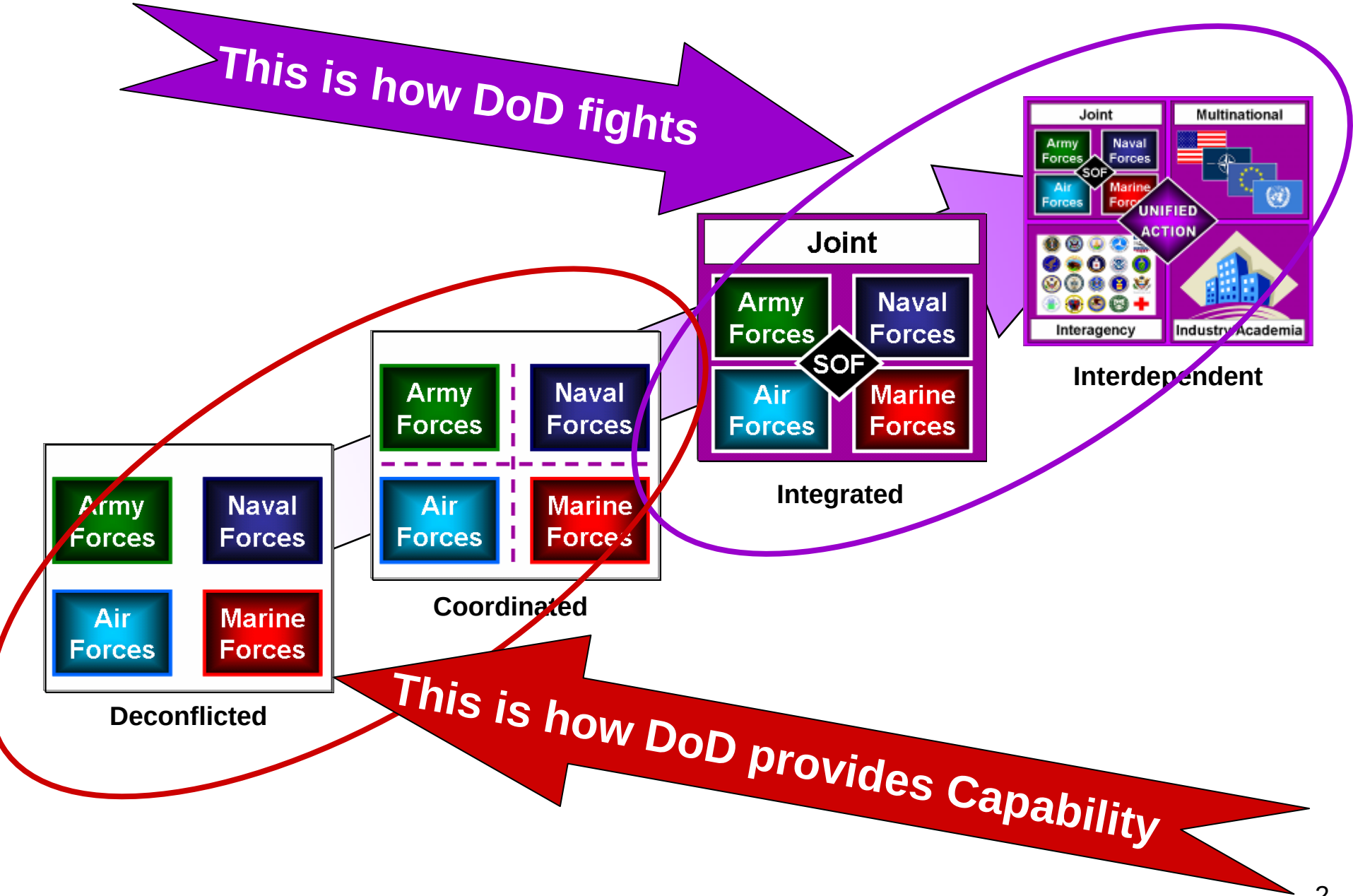
to

Precision Strike Association Summer Forum

11 July 2007

Major General Mike Hostage
USJFCOM J8
Joint Capability Developer

Transforming a Joint Force?



JC2 Development Challenges

- No designated, empowered Joint Advocate for joint capabilities
- We organize, train and equip C2 at the Service level but fight at joint level
- Lack of prioritization and balance across entire Joint Capability Area
- Unable to view JC2 across entire portfolio of contributing investments

2006 Quadrennial Defense Review (QDR) Report

The Department's Solution

- **Capability Portfolio Management**
  - Capability-based planning and management efforts to enable strategic choice and make capability tradeoffs
  - Integrate requirements/capabilities, acquisition and programmatics

- **Four capability areas selected as test cases**
  - Joint Command & Control (JC2)…**Commander USJFCOM**
  - Joint Net-Centric Operations (JNO)
  - Battlespace Awareness (BA)
  - Joint Logistics (JL)

DSD Memo (14 Sep 06) designated Commander USJFCOM as JC2 Capability Portfolio Manager (JC2 CPM)

Capability Portfolio Management (CPM) (26 Sep 06 DAWG)

MISSION: Establish capability portfolio management, responding to Department leadership, that delivers integrated joint C2 capabilities, improves interoperability, identifies and captures efficiencies, reduces capability redundancies and gaps, and increases joint operational effectiveness.

CPM Objectives

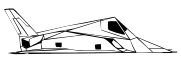
- **Advocate Warfighter operational requirements**
- **Provide authoritative Joint C2 direction:**
  - **Common data lexicon and strategy**
  - **Defined joint architectures**
  - **Interoperability standards**
- **Promote teamwork - leverage C/S/A expertise and insight**
- **Promote cross-program, enterprise-wide analysis for Joint C2**
- **Establish and use a persistent test and evaluation environment**
- **Identify issues, frame choices, and sustain "creative tension" to inform senior leader decisions**

Joint Capability Development Goal

Moving from …

System-based *to* Capability-based

B-1B

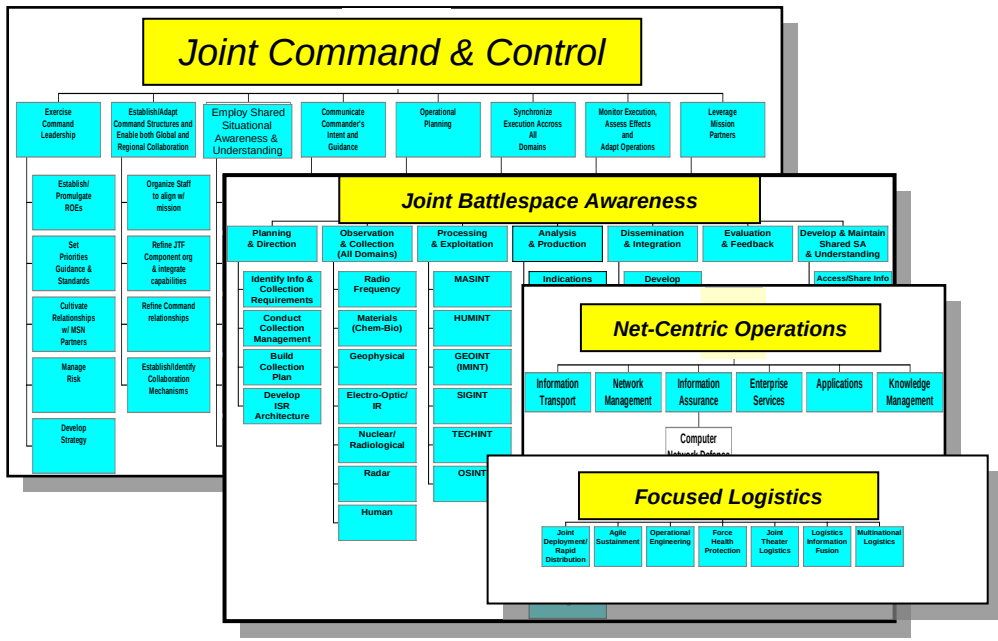


F-117A

F-16

F/A-18

22 Joint Warfighting Capability Areas



Capability Portfolio Management Engine

JOINT WARFIGHTER

Assigned Mission

JTF HQ

Joint Tasks

Service Tasks

UJTLs
X.X
X.X.X
X.X.X.X
X.X.X.X.X

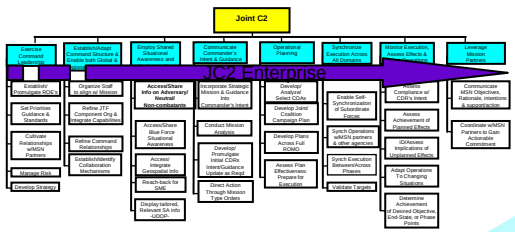
AUTLs
MCTL
NTTL
AFTL

Operational Activities / Tasks / Sub-tasks

CAPABILITY MAPPING

Strategic Objectives

- Provide relevant information to decision makers
- Provide warfighters shared situational awareness and understanding
- Provide coalition forces, subordinate units and mission partners access to timely, relevant, accurate, and actionable information
- Provide a common, standard lexicon among DOD, non-DOD agencies and allied/coalition members
- Provide the means for commanders to promulgate accurate and timely intent



Capability Mix

SERVICES

Programmatic Data & Details

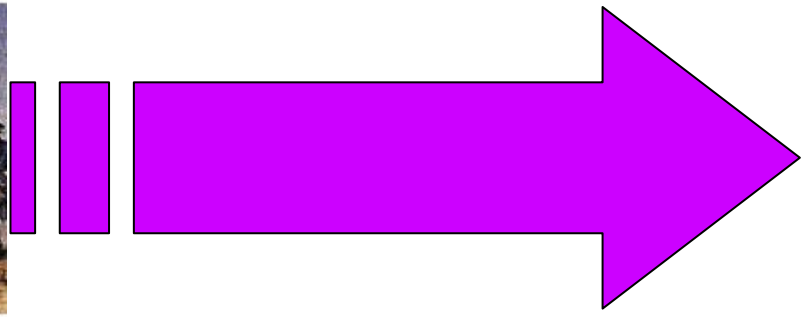
JC2 Interest Programs & Initiatives

ABCS
AFATDS
AMDPCS
AOC-WS
ArcView GIS
ATDLS
BCS-M
C2PC
CACES
CATS/HPAC
CCIC2S
CDET
CEC
CHATS
C/JMTK
CMMA
CMWS
CSEL
DCTS
DIB
DJC2
FBCB2
FCS
GBS
GCCS-A
GCCS-I3
GCCS-J
GCCS-M
GCSS
GSORTS
IMETS
IMOM
ISPAN
IRC
IWS
JADOCS
JALIS
JBFSA
JEPES
JFAST
JMS
JMTK
JMV
JMNS
JOPES
PRMS/JPRA
JTAT
JTAV
JTCW
JTIDS
JTRS
JTT
JWARN
MAT
MIDS
MIS
MUOS
NCES
NECC
ONA
PFPS/Falcon View
SECOMP-I
SJFHQ
SOFTools
TACP/ASOC
TBMCS
TBMWD
TCO
TKC2
WIN-T

Duality of Portfolio Management

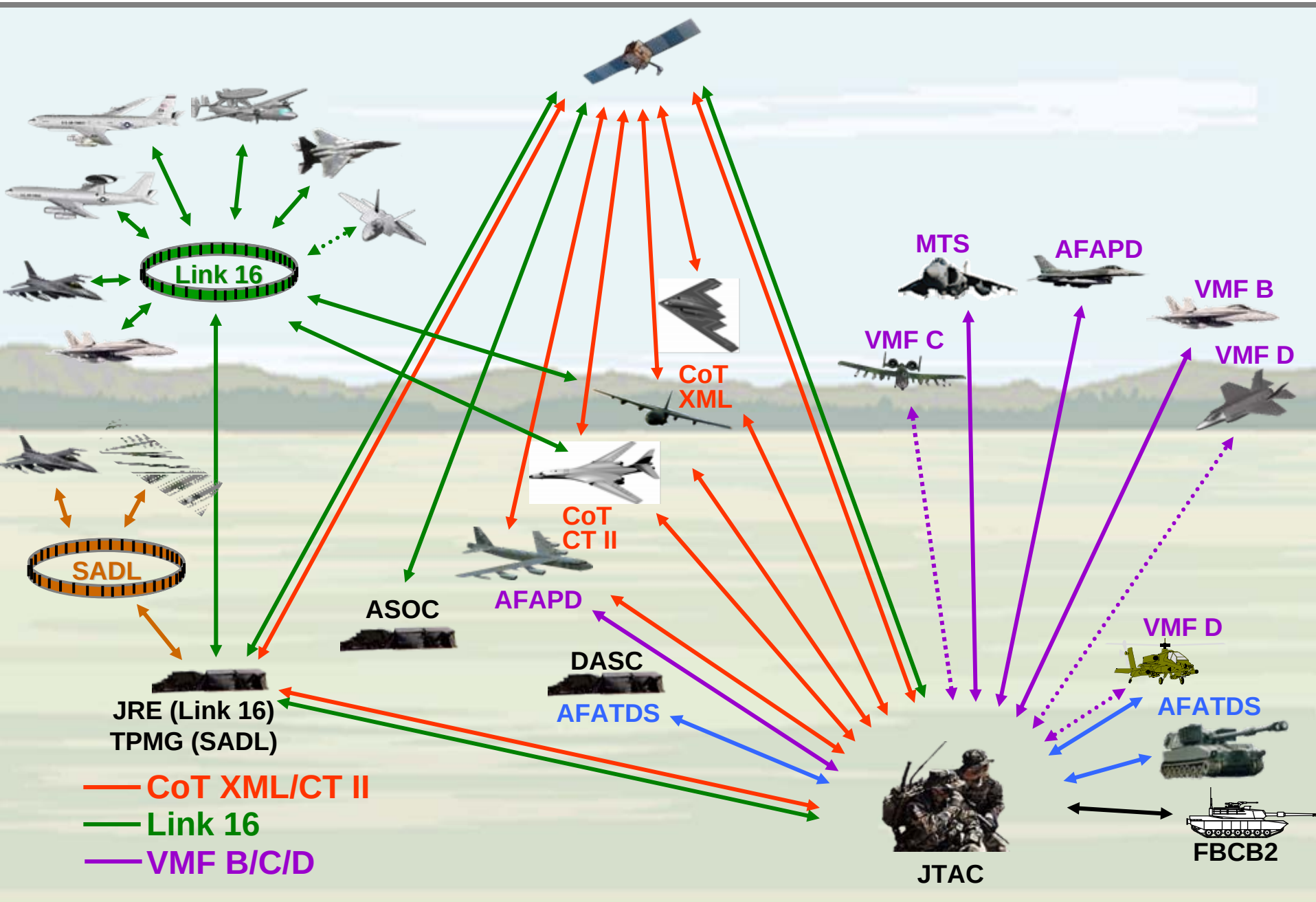
- Establishment of the Vision of Future Capability
  - Born Joint
  - Net Enabled Command Capability (NECC)
  - DoD C2 Roadmap, JBMC2 Roadmap, C2 Migration Plan
  - Architectures, Data Strategy, Standards

- Migration of Legacy Programs
  - POM Guidance
  - Focus Integration Team (FIT)



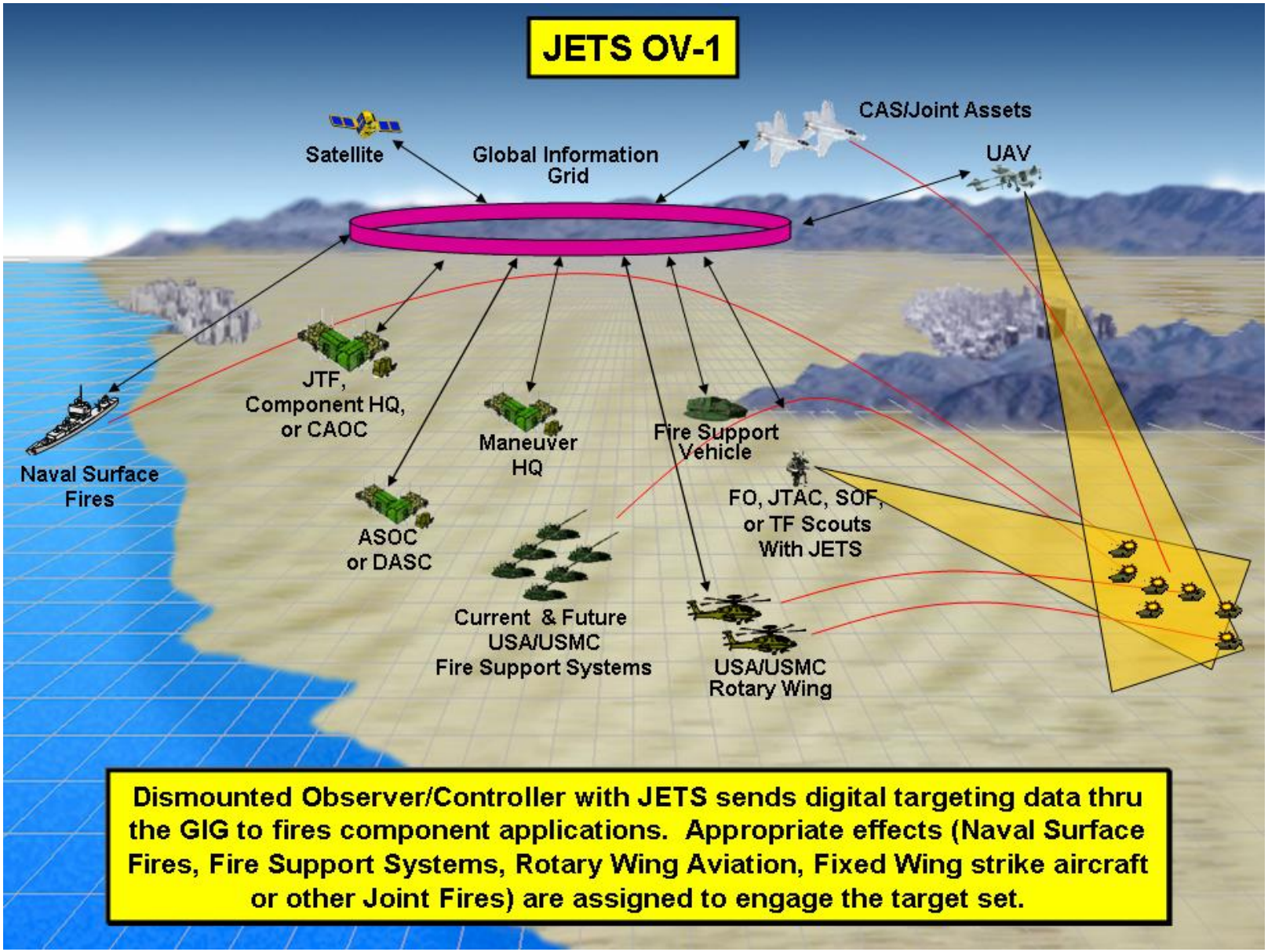
CPM Process must address both

Digital JCAS Interoperability – Today

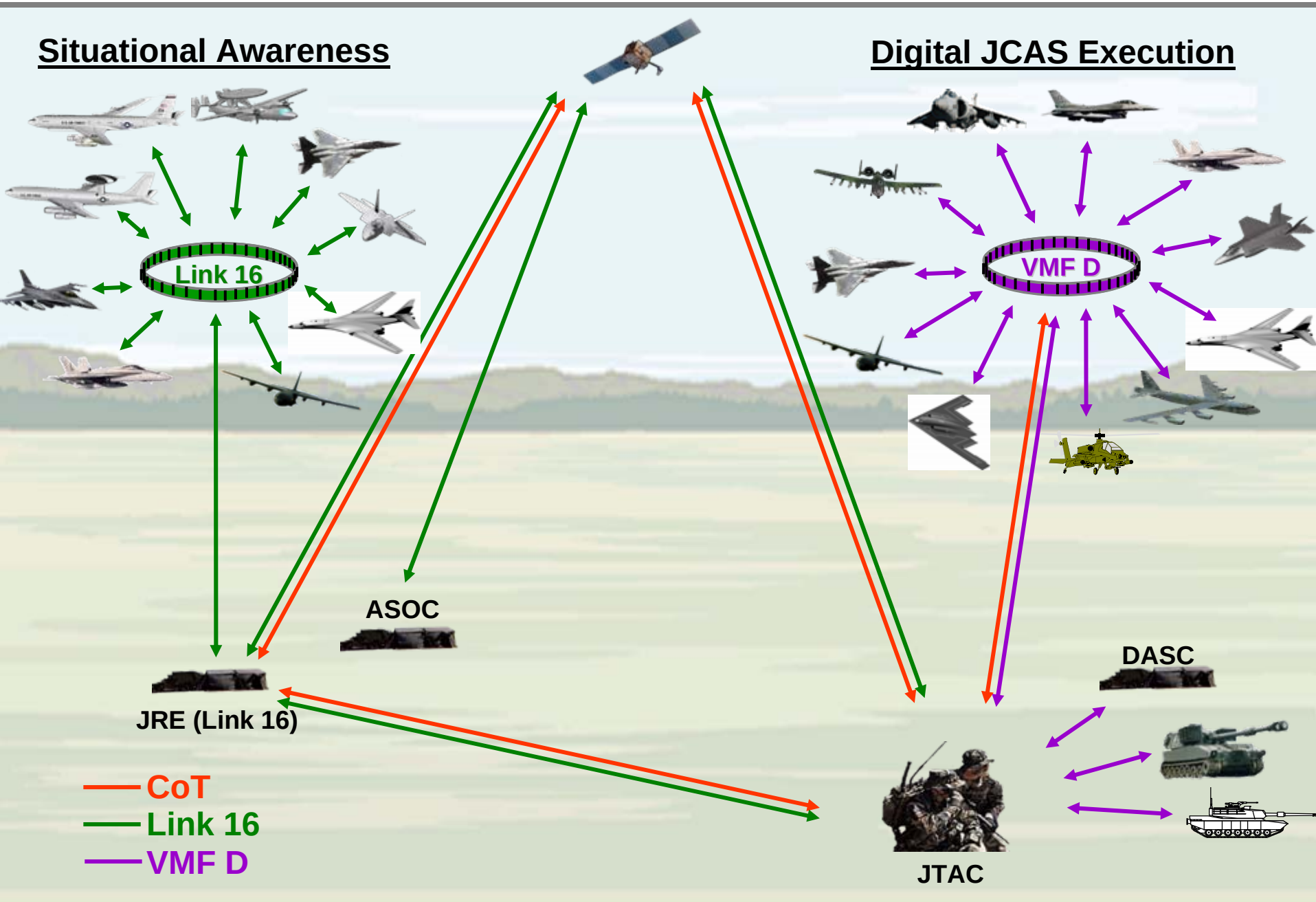


Dismounted JTAC

Joint Effects Targeting System



Digital JCAS Interoperability – 2013



Focus Integration Team

- Establish partnership with C/S/A SMEs
- Leverage existing capability analysis
  - Focus on gaps, efficiencies, redundancies
- Produce POM / APOM recommendations to achieve enhancements
- Assess Service / Agency POMs for guidance compliance
  - Develop input to consolidated JC2 CPM Issue Paper as required

Persistent Engagement

APOM 09 FIT Cells

- JTF Headquarters
- Deployable C2
- Integrated Fires/Blue Force Tracker
- Common Operational Picture
- Adaptive Planning
- Force Readiness
- Collaborative Information Environment
- Joint Execution Mission Management
- Common Tactical Picture
- Cross Domain Solutions
- Machine Foreign Language Translation
- NECC Migration Strategy
- Effects Based Approach to Operations

All stakeholders partnered and leveraged

Way Ahead

JC2 Capability Portfolio Manager will:

- Ensure COCOM Warfighting perspective is represented
- Institutionalize C/S/A teaming for Joint Solutions
- Work within priorities across capability portfolio
- Seek optimum C2 capability decisions across C/S/A C2 capability domain

Requirement Driven / Capability Based /

Fiscally Informed and Warfighter Supportive

Questions

Air Force Precision Strike Weapons Development Status

Richard D. Justice, Colonel, USAF
Commander, 918th Armament Systems Group
Air Armament Center, Eglin AFB, FL

U.S. AIR FORCE

Outline

- Air Armament Center Successes
- Status of Current Weapons
- Next Generation & Future Weapons

The Heart and Soul of the Air Force is Range and Payload

– Gen Moseley at 2006 Blue Summit

The Air Armament Center fields the Payload that puts the “Force” in Air Force

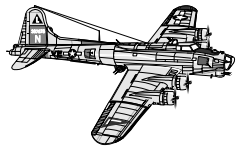
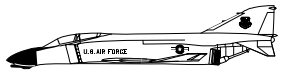
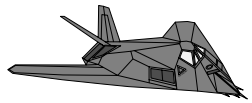
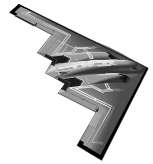
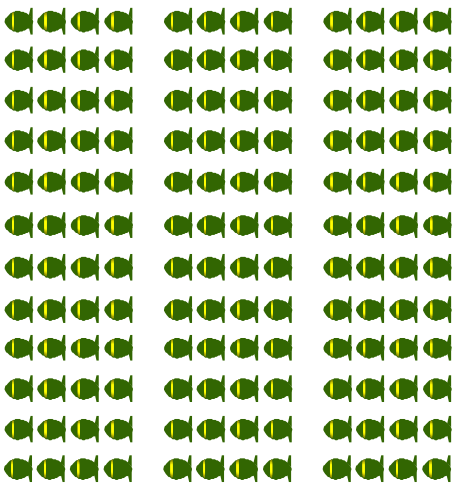
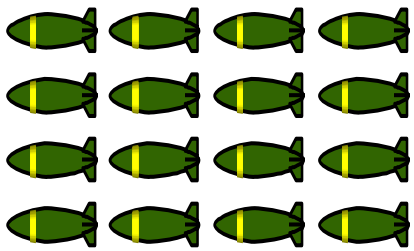
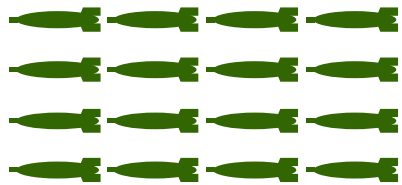
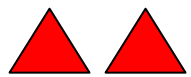
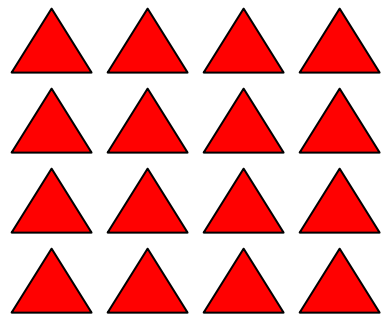
What We Do at AAC

From Concept to Employment

- **Science & Technology w/ AFRL, DTRA and Others: Develop the idea and produce a tech demonstration**
- **Product Support w/ Acquisition Organizations: Manage the Development of the weapons**
- **With 46TW, 53d W, AFOTEC and Sister Services Conduct Test & Evaluation to prove weapon readiness**
- **With ALC's and Sister Services Sustain and Demil the stockpile**
- **Run an AF base supporting Expeditionary Air Force**

Transition Technology to Weapon Systems and Provide War Winning Capabilities On Time, On Cost

Evolution of Precision

1943	1970	1991	2004
			
WWII **1500 B-17 sorties** **9000 bombs (250#)** **3300 ft CEP** **One 60' x 100' target**	**Vietnam** **30 F-4 sorties** **176 bombs (500#)** **400 ft CEP** **One target**	**Desert Storm** **1 F-117 sortie** **2 bombs (2000#)** **10 ft CEP** **2 targets per sortie**	**OAF/OEF/OIF** **1 B-2 sortie** **16 bombs (2000#)** **7 ft CEP** **16 Targets per Pass**
			
			

Air Armament Family

Status of Current Weapons

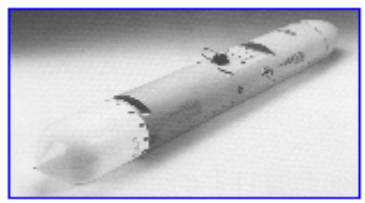
Highlighting Some of Our Air Armament Center Success

Small Diameter Bomb (SDB I)

Joint Direct Attack Munition (JDAM)

Sensor Fuzed Weapon (SFW)

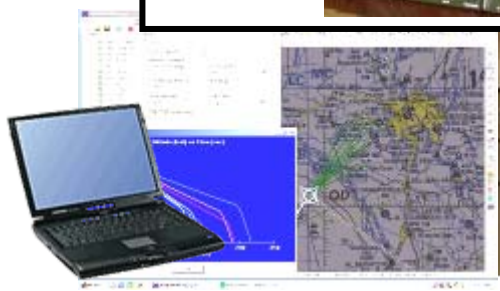
Wind Corrected Munitions Dispenser (WCMD)



HARM Targeting System (HTS)

Small Diameter Bomb (SDB I)

- All-weather, autonomous, precision strike
- Decrease collateral damage
- Increased loadout for multiple strikes per sortie at standoff ranges
- IM compliant 250-lb class multipurpose warhead
- Diamond-back wing provides increased range
- 4-piece pneumatic carriage system
- Cockpit-selectable electronic fuze – impact, height-of-burst & delay
- INS/GPS augmented by differential GPS
- Anti-jam GPS with SAASM

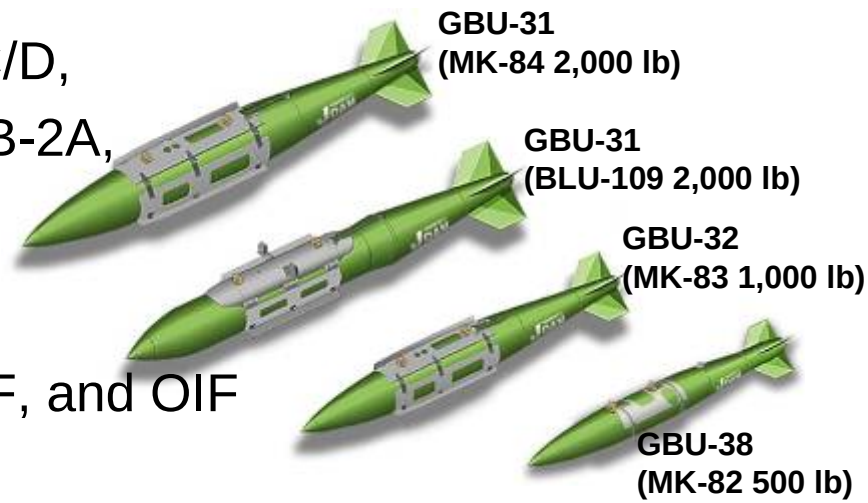


Mission Planning

Logistics

Joint Direct Attack Munition (JDAM)

- Global Positioning System (GPS) aided Inertial Navigation System (INS) tail kit
- Mk 80 Series/BLU-109 warhead compatibility
- Accurate <5 meters, in-flight retargeting
- Autonomous and adverse weather
- Operational on F-15E, F-16C/D, F/A-18C/D, F/A-18E/F, F-22A, F-117, AV-8B, B-1B, B-2A, and B-52H
- Over 166,000 delivered
- Over 16,675 combat-proven in OAF, OEF, and OIF



Consistently Accurate, Reliable, & Affordable Guidance Kit
The Warfighter's "Air-to-Ground Weapon of Choice"

Wind Corrected Munitions Dispenser (WCMD)

- Tail kit for guiding dispenser weapons
- INS corrects for winds, launch transients and ballistic errors
- Accuracy: 100ft req'd; ~50ft demo'd
- Fielded on B-1, B-52, F-15E, F-16C/D
- Future fielding on A-10, F-35
- Combat proven: 1,650 used in OEF/OIF
- Full Rate Production completed Oct 06
  - 27,596 tail kits built
  - AUPP (BY94): $25K req, $13.5K actual

Sensor Fuzed Weapon (SFW)

- Unpowered, top attack, wide area, cluster munition, designed to achieve multiple kills per aircraft pass against enemy armor and support vehicles
- 1000 lb Tactical Munitions Dispenser
  - 10 Submunitions Each With 4 Projectiles
- Operational on F-16C/D, F-15E, A-10, B-52, B-1B, B-2
- Combat Proven in Operation Iraqi Freedom

BLU-108 Submunition

Projectile (40 per)

SFW Characteristics

Length:	**231 cm (91 inches)**
Diameter:	**39.6 cm (15.6 inches)**
Weight:	**417 Kg (920 Lbs.)**

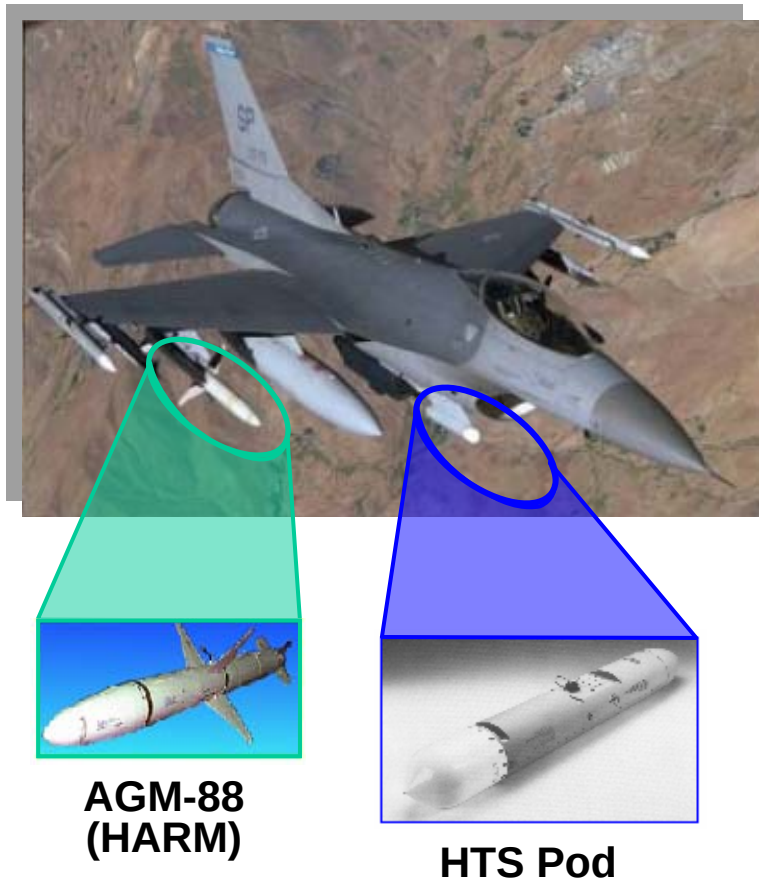
Joint Air-to-Surface Standoff Weapon
JASSM

Air Force program provides an autonomous, long range, conventional, air-to-ground, precision missile able to strike highly defended, high value targets

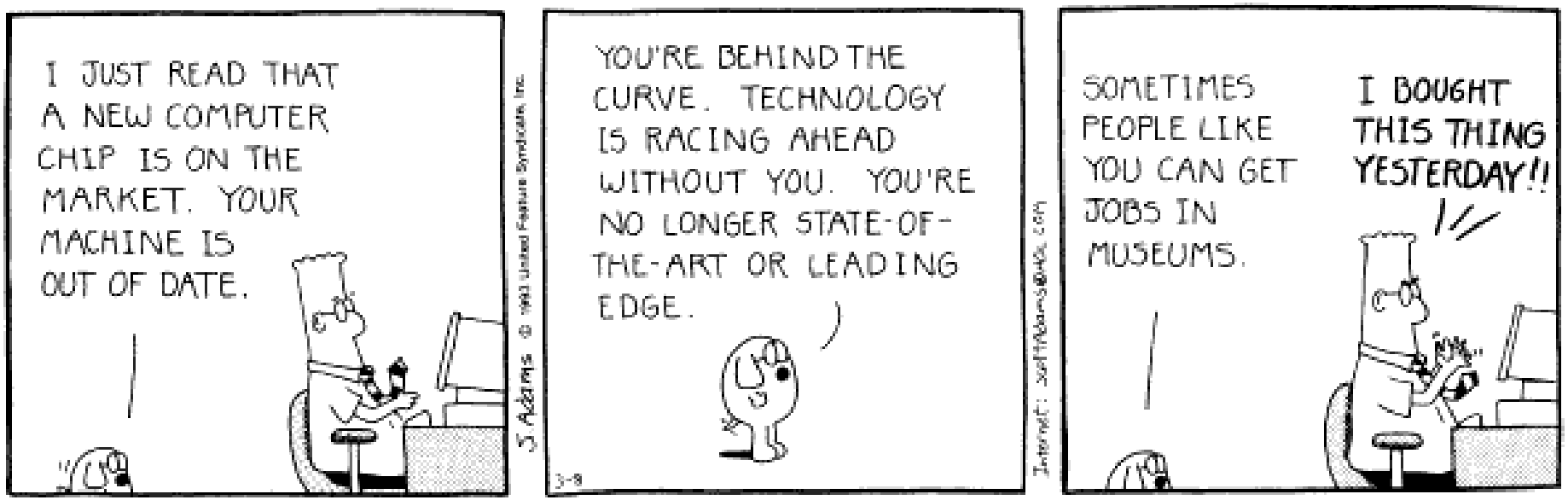
- **Takes out enemy command and control**
- **Survives the advanced threat environment**
- **Reduces risk to aircrew**
- **Operates in adverse weather**
- **Launches from both fighters and bombers**
- **Reduces mission planning timelines**

HARM Targeting System (HTS)

- Rapidly generate ranges to target radars & provides greater discretion between different types of enemy radars
- Current Pod (R6) Enhances F-16CJ Ability To Target/Kill Enemy Radar Supports Suppression Of Enemy Air Defenses (SEAD) Wild Weasel Mission Area
  - High Speed Anti-Radiation Missile (HARM) Has Been Primary Weapon
- New R7 Pod Allows PGM Targeting And Multi-Ship Data Sharing Capabilities For Destruction Of Enemy Air Defenses (DEAD) Role
  - Brings JSOW, JDAM, JASSM, WCMD-ER, & SDB to DEAD mission
- 8 in diameter, 56 in long, 85 lb



Future Technology Opportunities

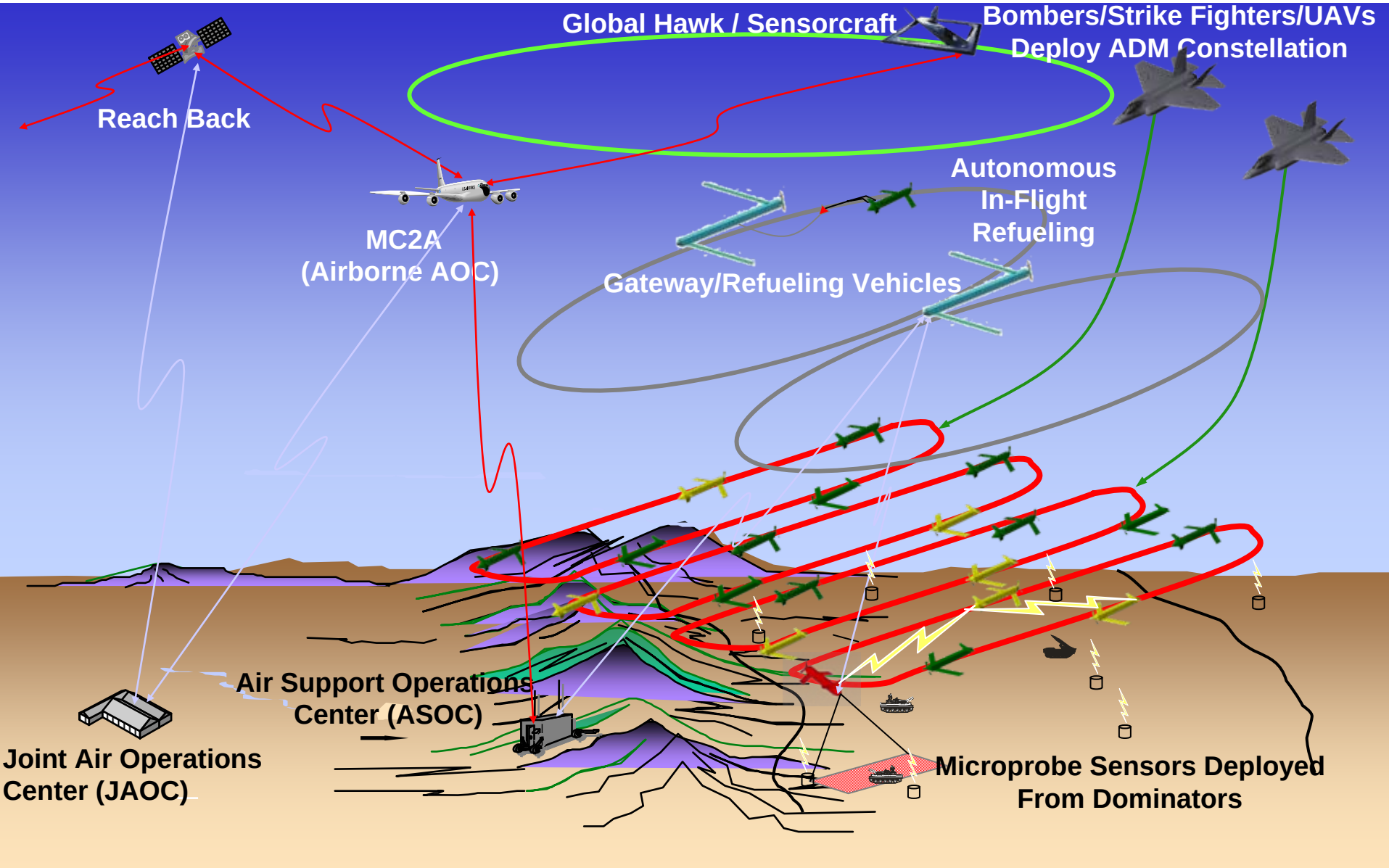


What Are Next Generation Weapon Effects?

Air Armament Focus

- **Network Enabled Weapons**
- **Universal Aircraft Interface**
- **Directed Energy**
- **Mobile Targets**
- **Low Collateral Damage**

Networked Weapons



Universal Armament Interface (UAI) Technical Approach

Program Objective: <u>Decouple</u> weapon integration schedules from aircraft OFP update cycle

Directed Energy

- **AAC Established as Center of Excellence for Directed Energy**
  - **Supporting SOCOM Advanced Tactical Laser (ATL) ACTD**
  - **Planning ATL Extended User Evaluation**
  - **Transition planning for active denial systems**

New Strike Weapons Challenges

Hit a moving target in weather

Small Diameter Bomb (SDB II)

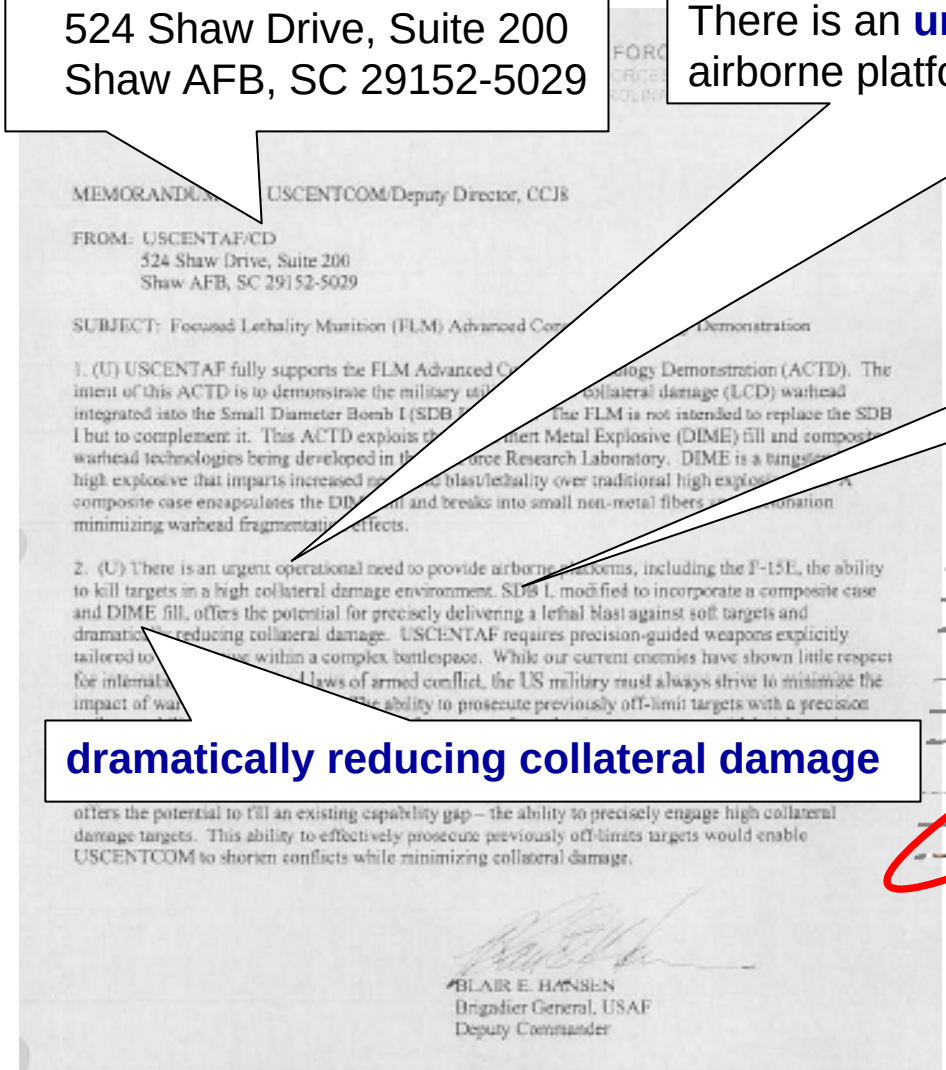
- SDB II provides the warfighter with precision tactical standoff capability against mobile targets in all weather conditions.
  - Increased Loadout / Kills Per Sortie
  - Minimum Collateral Damage
  - Anti-Jam GPS / INS
  - Reduced Logistics Footprint
  - Multi-mode Seeker
  - Utilizes Weapon Datalink
  - Link 16 and UHF
  - Size: ~70 inches and 250 lbs
  - AUPP (BY05$)
    - THR $86K, OBJ $61K
  - 40+ Nautical Miles Standoff

Focused Lethality Munition (FLM)

USCENTAF/CD
524 Shaw Drive, Suite 200
Shaw AFB, SC 29152-5029

There is an **urgent operational need** to provide airborne platforms, including the **F-15E**

SDB I, modified to include a **composite case** and **DIME fill**



MEMORANDUM FOR USCENTCOM/Deputy Director, CCJ8

FROM: USCENTAF/CD
524 Shaw Drive, Suite 200
Shaw AFB, SC 29152-5029

SUBJECT: Focused Lethality Munition (FLM) Advanced Concept Technology Demonstration

1. (U) USCENTAF fully supports the FLM Advanced Concept Technology Demonstration (ACTD). The intent of this ACTD is to demonstrate the military utility of a low collateral damage (LCD) warhead integrated into the Small Diameter Bomb I (SDB I). The FLM is not intended to replace the SDB I but to complement it. This ACTD exploits the Dense Inert Metal Explosive (DIME) fill and composite warhead technologies being developed in the Air Force Research Laboratory. DIME is a tungsten high explosive that imparts increased [illegible] blast/lethality over traditional high explosives. A composite case encapsulates the DIME fill and breaks into small non-metal fibers upon detonation minimizing warhead fragmentation effects.

2. (U) There is an urgent operational need to provide airborne platforms, including the F-15E, the ability to kill targets in a high collateral damage environment. SDB I, modified to incorporate a composite case and DIME fill, offers the potential for precisely delivering a lethal blast against soft targets and dramatically reducing collateral damage. USCENTAF requires precision-guided weapons explicitly tailored to [illegible] within a complex battlespace. While our current enemies have shown little respect for international laws of armed conflict, the US military must always strive to minimize the impact of war [illegible] ability to prosecute previously off-limit targets with a precision [illegible] offers the potential to fill an existing capability gap – the ability to precisely engage high collateral damage targets. This ability to effectively prosecute previously off-limits targets would enable USCENTCOM to shorten conflicts while minimizing collateral damage.

BLAIR E. HANSEN
Brigadier General, USAF
Deputy Commander

dramatically reducing collateral damage

SDB I Hardware Attaches to Composite Case

New Technology
- **Composite Case Warhead**
- **MNX-1209 Explosive (DIME*)**
- **Blast Only**

Affordable Moving Surface Target Engagement (AMSTE)

- CSAF-Directed Program to Field Limited Near-Term Maritime Interdiction Capability for PACAF
  - Operationalize Capability Demonstrated Nov 04 Resultant Fury Exercise
  - 2000 lb JDAM Datalinked to Receive In-flight Target Updates From JSTARS
- AMSTE Jointly Managed by JDAM & JSTARS Program Offices To Deliver Integrated Capability
  - JDAM Required Assets Available May 09 (Sep 08 Objective)
  - Contract Award in FY07
  - Production Award in FY08

Laser Joint Direct Attack Munition (LJDAM)

- Field-Installable Seeker Kit For Inventory JDAMs
  - Laser guidance for moving target capability
  - GPS/INS guidance retains baseline stationary accuracy
- LJDAM Development Internally Funded By Boeing
  - 2005/2006 Technology Development and SDD Activities
  - Completion of environmental qualification testing
  - Six flights (3 Stationary, 3 Movers)
- Evaluated in 2007 USG Demo
  - 11/12 hits on fast movers
  - Positive fielding recommendation

We Have Been Well Recognized

Joint Direct Attack Munition

David Packard Excellence in Acquisition Award

Perry Award at the Precision Strike Conference

Sensor Fuzed Weapon

DoD Value Engineering Award

Passive Attack Weapon

John J. Welch Award

David Packard Excellence in Acquisition Award

B-2 Shelter

Jacobs Master Builder Award

Wind Corrected Munitions Dispenser

Outstanding AFMC Contracting Team Award

Advanced Medium Range Air-to-Air Missile

Bernard J. Schriever Award

Outstanding AF System Program Director

Outstanding AF Program Manager

Air Armament Academy

1st Annual USD AT&L Workforce Development Award

Small Diameter Bomb

John J. Welch Award

Perry Award at the Precision Strike Conference

War-winning Capabilities …

Help Design Supportability Into Tomorrow's Weapons Today

… On Time, On Cost

Headquarters Air Combat Command

Precision Engagement In The USAF

Major General Dave Clary
Air Combat Command
Vice Commander

This Briefing is:
UNCLASSIFIED

Overview

- Snapshot of Current Operations
- Global Strike
- Precision Engagement
- F-22
- Gaps

Challenging Times

Air Force Priorities

- **Fight and Win The Global War on Terror**
- **Develop and Care for Airmen and Their Families**
- **Recapitalize and Modernize Our Force**

Deployed Airmen

- **35,000 Airmen deployed**
  - **25,000 CENTCOM AOR**

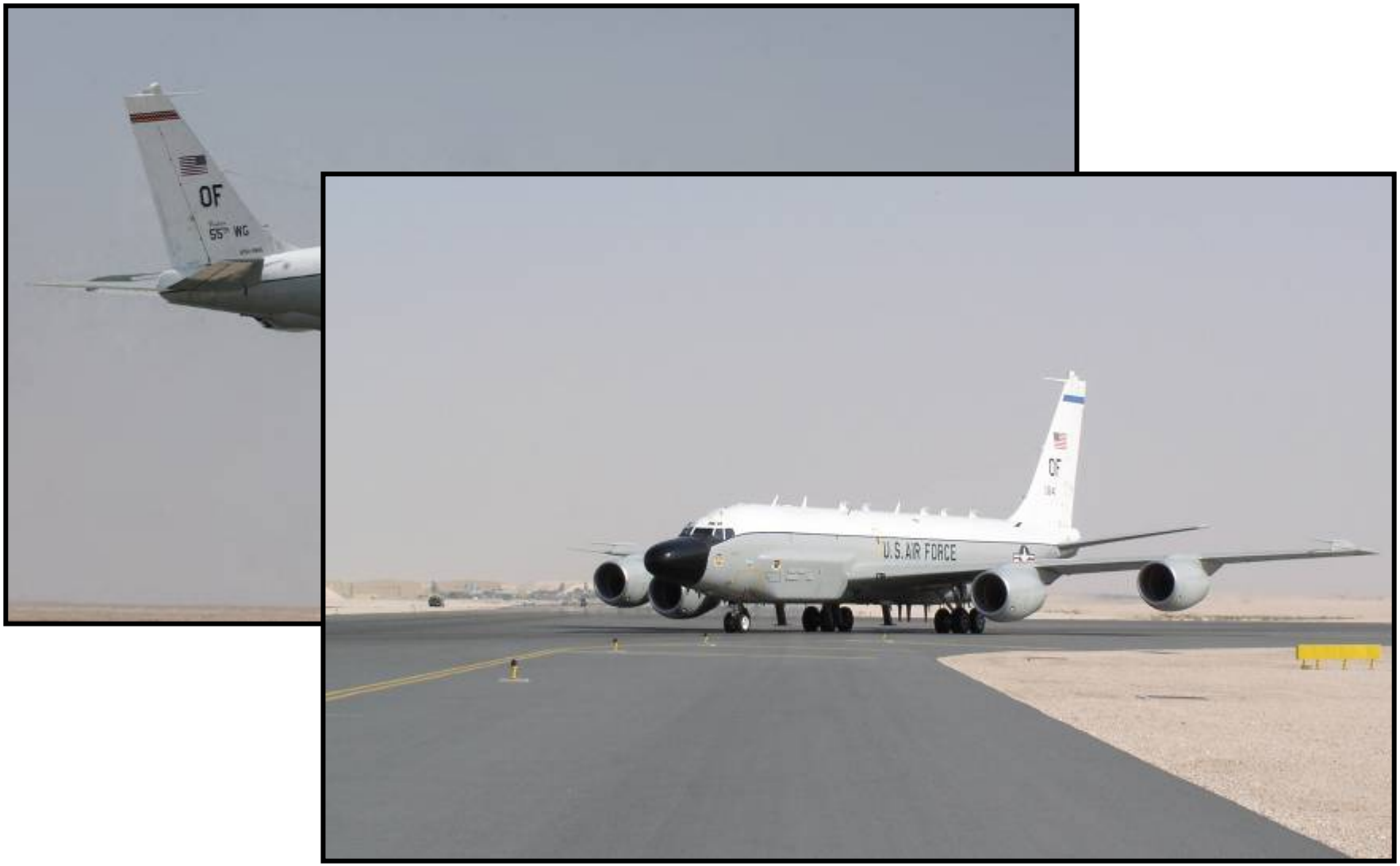
- **10,000+ deployed on 179-day rotations**

- **1,000+ deployed on 365-day rotations**
  - **677% increase since 2005**

CENTCOM AOR

- **Operating out of 10 major bases**
  - **60 different locations**
- **80,000 sorties over the past year**
- **250 sorties per day in Iraq and Afghanistan**

CENTCOM AOR

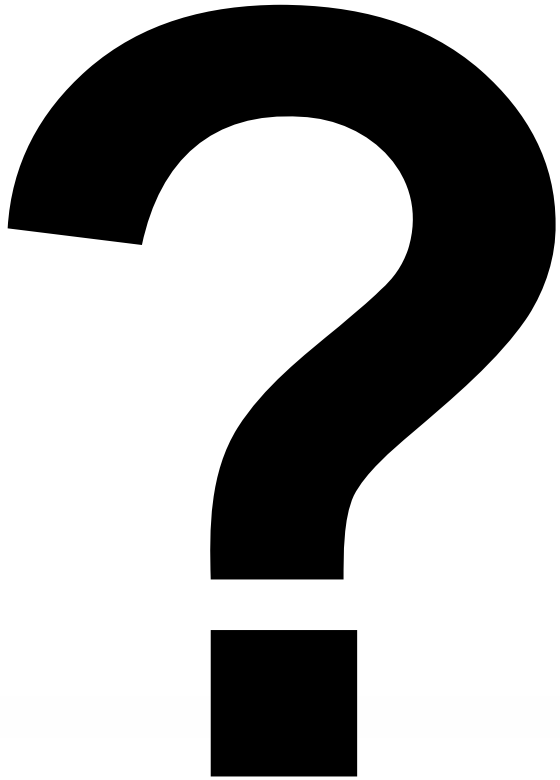


Homeland Defense

- **48,000 sorties since 9/11**
- **Stand up of 1st AF AOC**

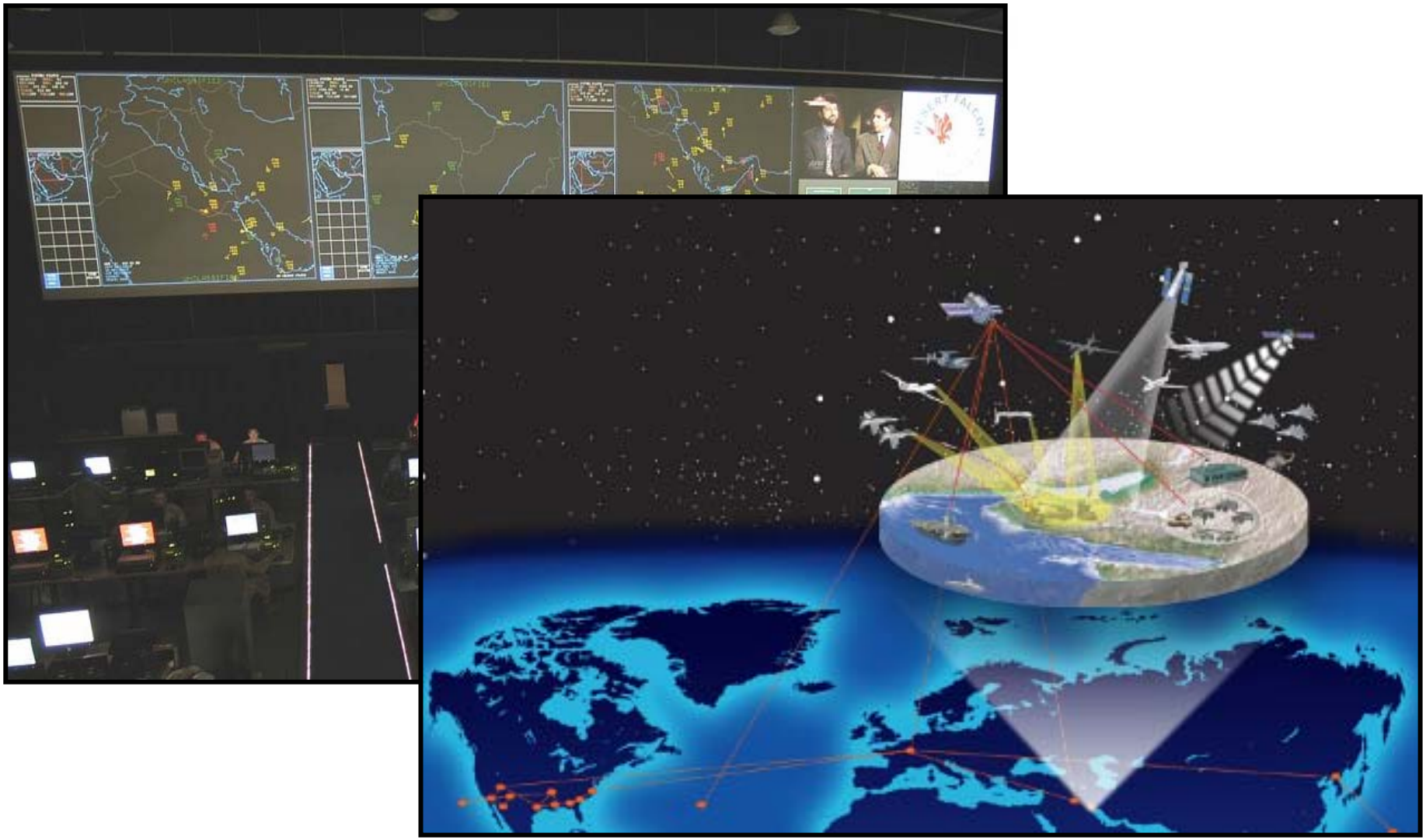
Today's Enemies

Tomorrow's Threats



Threat

Required Capabilities



AF CONOPS Construct

Strategy

Tasks

Global Power

Global Reach

Global Vigilance

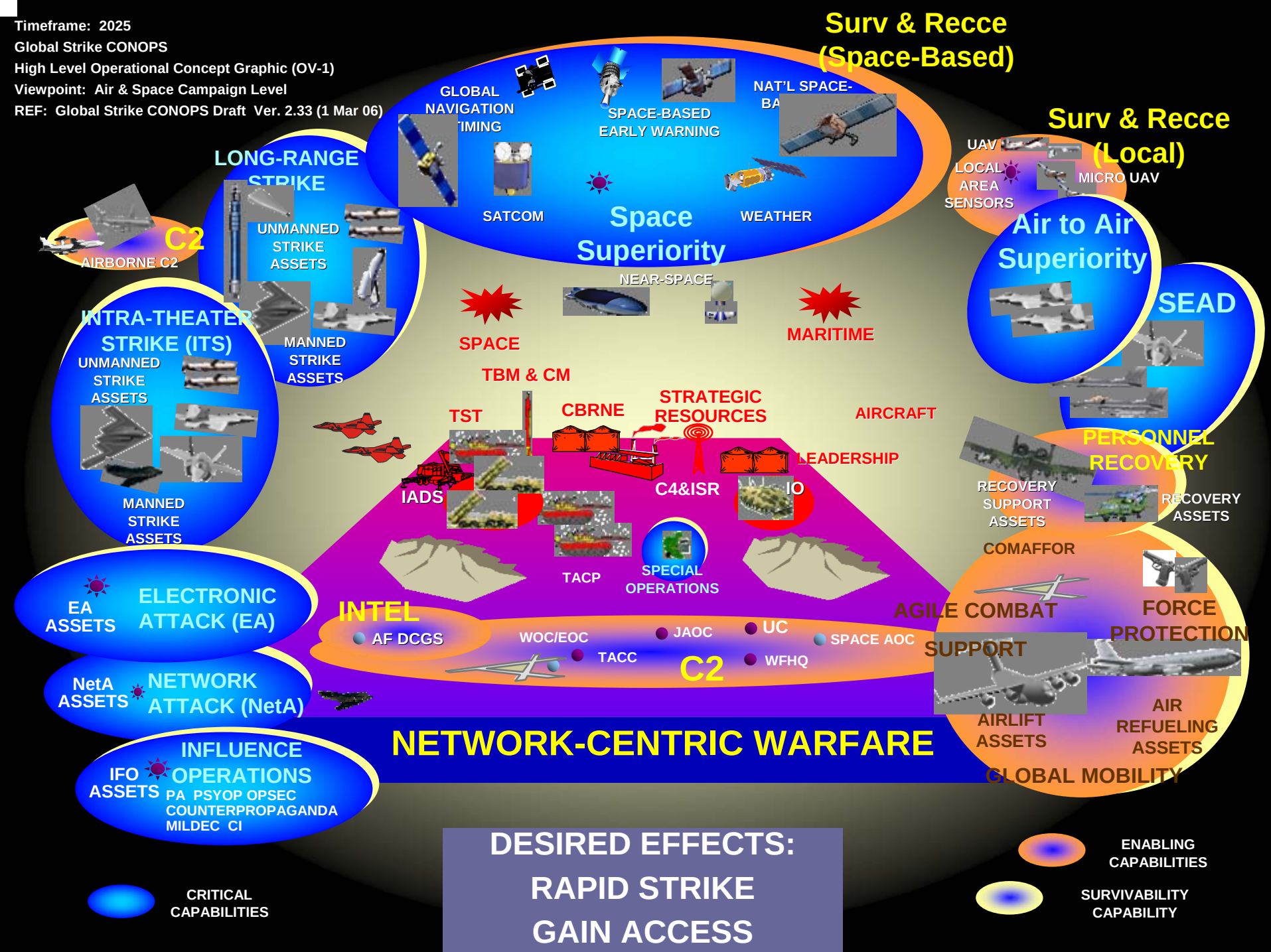
Air and Space Expeditionary Force (AEF) is the USAF foundation to prepare, respond, deploy, and employ for any task

10 Air Expeditionary Forces

Capabilities Review & Risk Assessment

Homeland Defense & Civil Support CONOPS	Global Strike CONOPS	Global Mobility CONOPS	Global Persistent Attack CONOPS	Nuclear Response CONOPS	Space & C4ISR CONOPS

Agile Combat Support


Timeframe: 2025
Global Strike CONOPS
High Level Operational Concept Graphic (OV-1)
Viewpoint: Air & Space Campaign Level
REF: Global Strike CONOPS Draft Ver. 2.33 (1 Mar 06)
Surv & Recce (Space-Based)
GLOBAL NAVIGATION
SPACE-BASED EARLY WARNING
NAT'L SPACE-BA
SATCOM
Space Superiority
WEATHER
Surv & Recce (Local)
UAV
LOCAL AREA SENSORS
MICRO UAV
LONG-RANGE STRIKE
UNMANNED STRIKE ASSETS
C2
AIRBORNE C2
Air to Air Superiority
SEAD
NEAR-SPACE
SPACE
MARITIME
INTRA-THEATER STRIKE (ITS)
UNMANNED STRIKE ASSETS
MANNED STRIKE ASSETS
TBM & CM
TST
CBRNE
STRATEGIC RESOURCES
AIRCRAFT
LEADERSHIP
IADS
C4&ISR
IO
PERSONNEL RECOVERY
RECOVERY SUPPORT ASSETS
RECOVERY ASSETS
COMAFFOR
TACP
SPECIAL OPERATIONS
EA ASSETS
ELECTRONIC ATTACK (EA)
INTEL
AF DCGS
WOC/EOC
JAOC
UC
SPACE AOC
TACC
C2
WFHQ
AGILE COMBAT SUPPORT
FORCE PROTECTION
NetA ASSETS
NETWORK ATTACK (NetA)
AIRLIFT ASSETS
AIR REFUELING ASSETS
GLOBAL MOBILITY
NETWORK-CENTRIC WARFARE
IFO ASSETS
INFLUENCE OPERATIONS
PA PSYOP OPSEC
COUNTERPROPAGANDA
MILDEC CI
DESIRED EFFECTS:
RAPID STRIKE
GAIN ACCESS
CRITICAL CAPABILITIES
ENABLING CAPABILITIES
SURVIVABILITY CAPABILITY

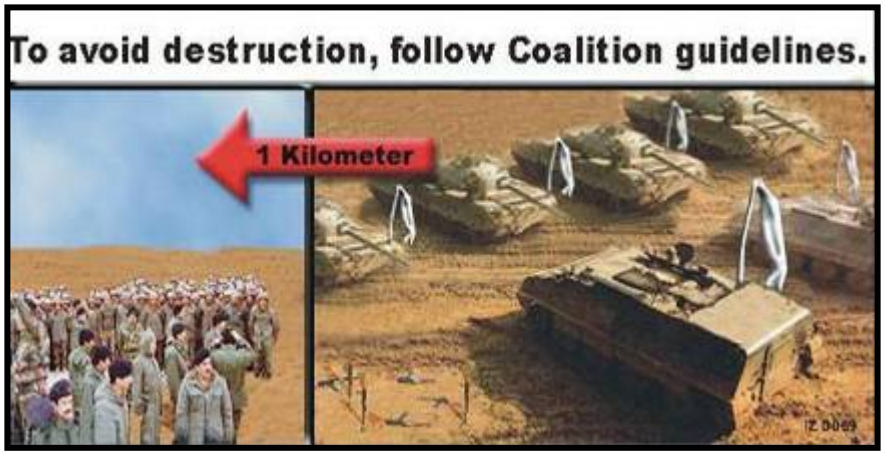
Precision…

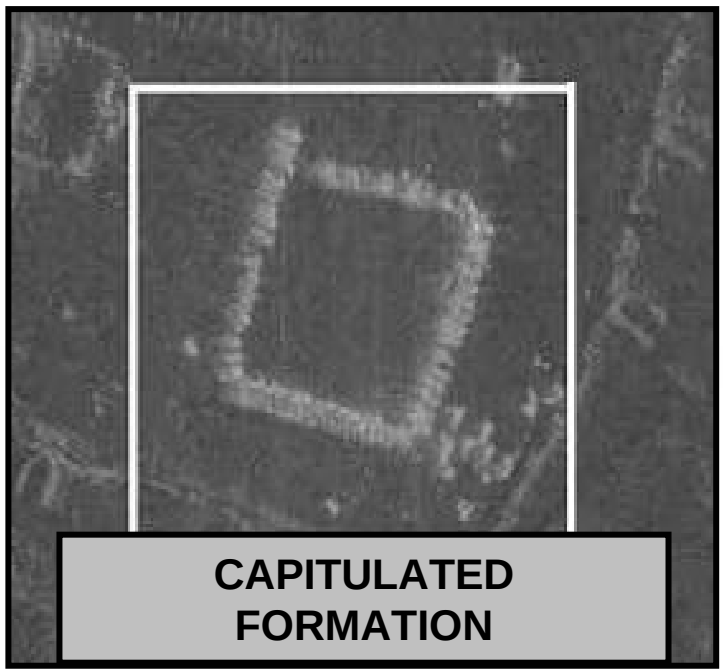

A-G TV NAVD CNTL
0Z
LIVE
FRAME
SPECIFIC TGT
AREA
(304M)
XMTH
L 3.4
000:02
SWAP TGT
DCLT

Leaps in Capability

Doumer Bridge

Iraqi Capitulation





Example of an IADS

Example of an IADS

The Solution

F-22 Multi-Role Capability

F-15C
Air
Superiority

F-117
Stealth
Strike

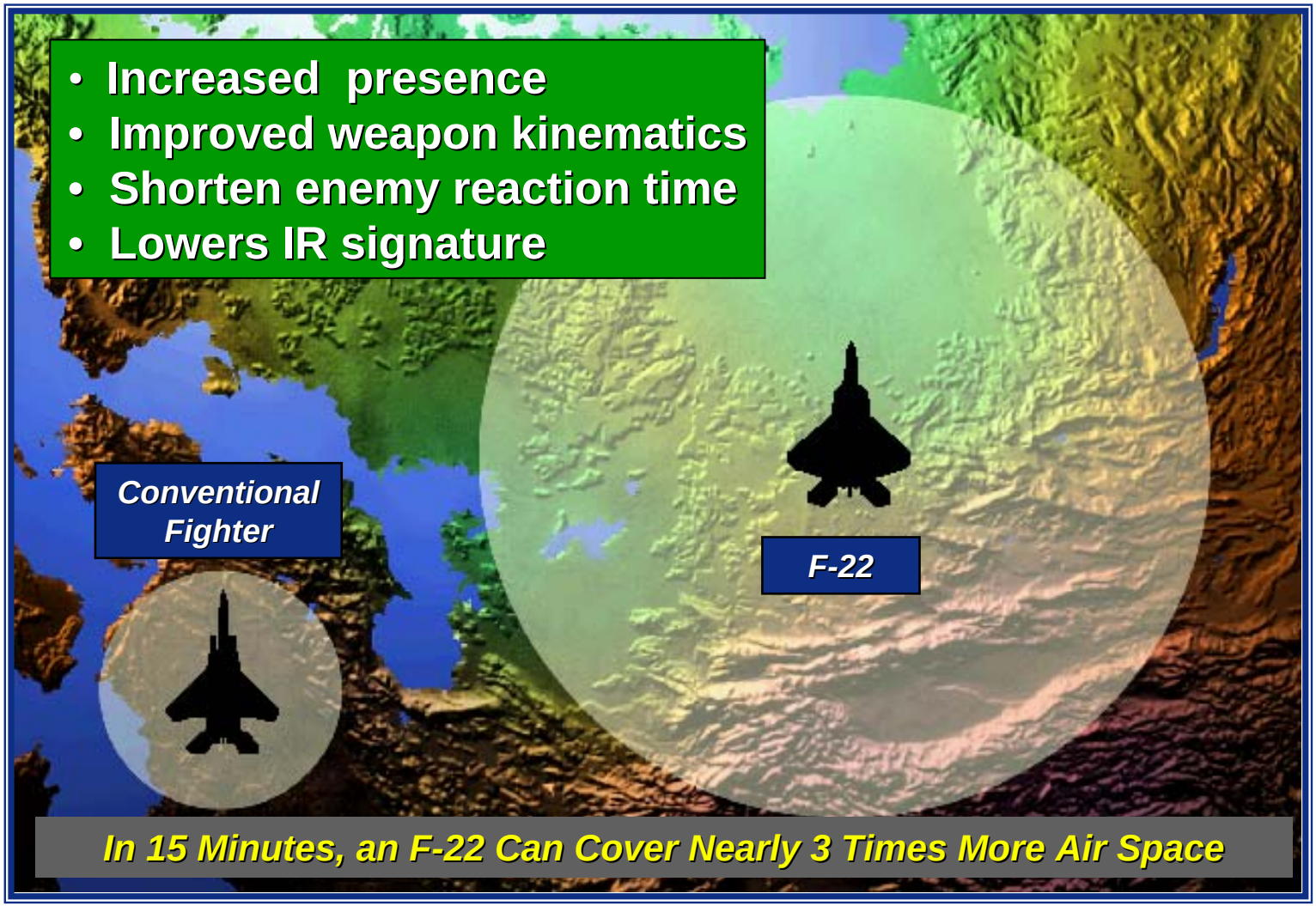
F-16CJ
SEAD

F15E
Precision
Strike

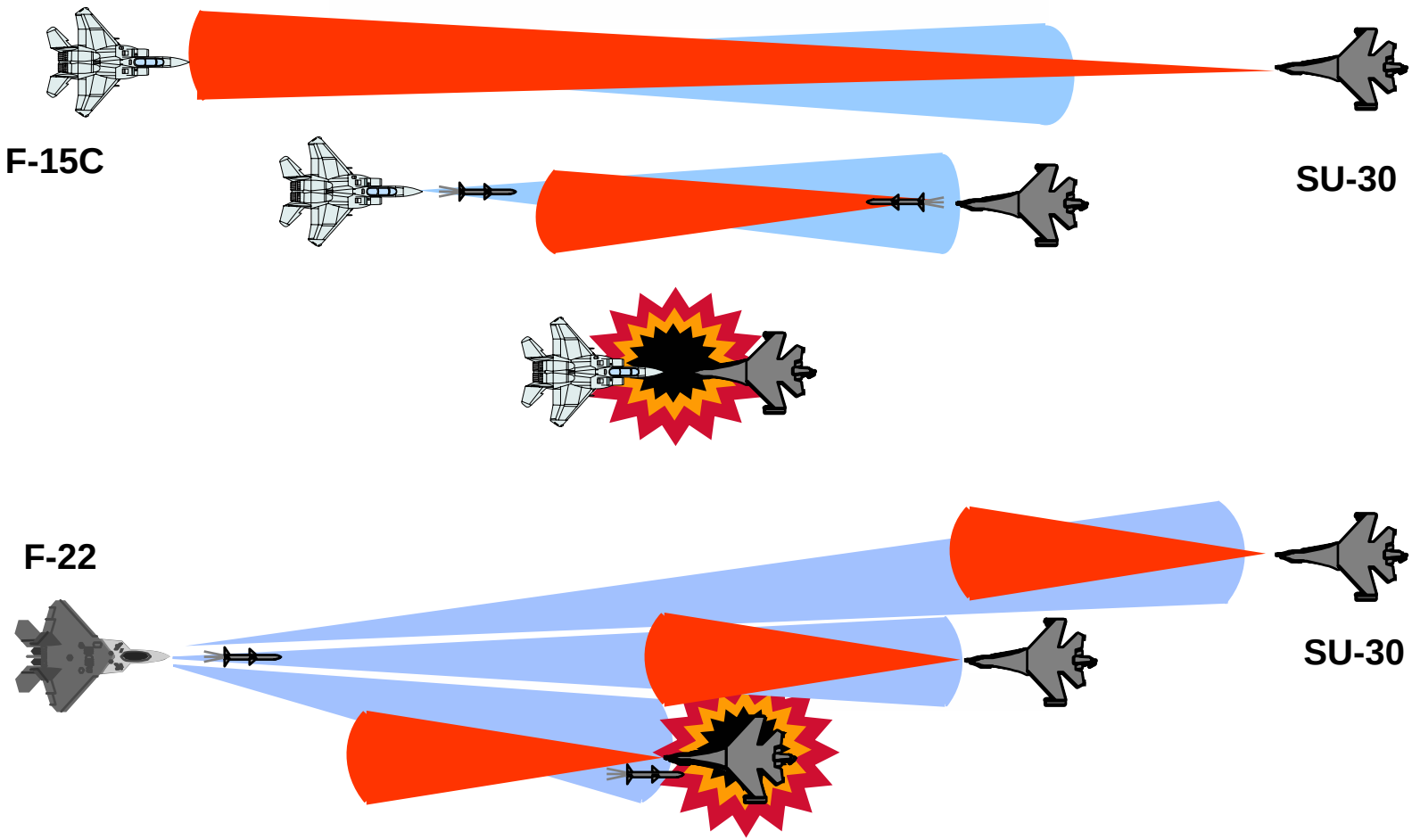
F-22 Performance Capabilities

- **Altitude: 60,000 ft**
- **Speed: 800 KCAS**
  Mach: 2.0
  Supercruise > Mach 1.5
- **G Load: 9**
- **AoA: -60 to > +60 deg**

Supercruise Advantages



Stealth in Air to Air



First Look, First Shot, *First Kill*

F-22 Weapons

F/A-22 Internal Weapons Carriage

Gun: M61 Cannon 480 rounds

<u>Side Bays</u>:
2 x AIM-9M/X

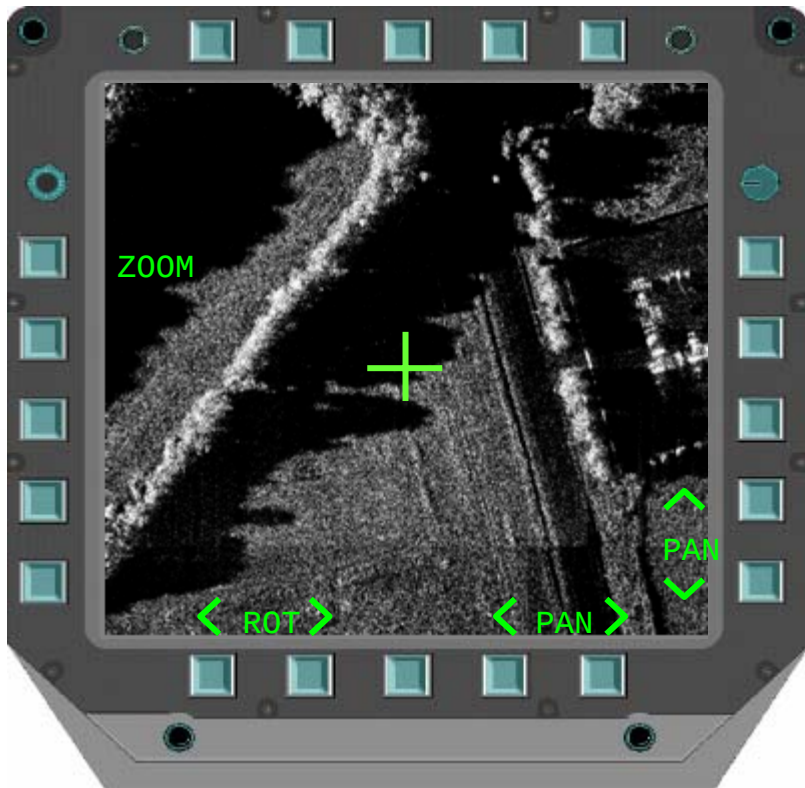
<u>Center Bay:</u>
6 x AIM-120C
or
2 x AIM-120C/
2 x 1000# JDAM

Valuable Air-to-Ground Capability

- All Weather
- Near Precision Joint Direct Attack Munition (JDAM)
- Four 5000 Pound External Wing Hardpoints

F-22 Battlefield Integration

- **Currently GBU-32 Only (Awaiting SDB)**
- **Combat HAMMER drops successful (50k @ 1.5M)**
- **<u>Bomb on Coordinate ONLY</u>**
  - **Future Upgrades allow Self-Generation of Coords**



Increasing 5th Gen Fighters

Complementary / Synergistic

F-22A **F-35A**

Complementary Missions

Air-to-Air Dominance ⟺ **Persistent Attack**
- Air Interdiction (AI)
- Close Air Support (CAS)

Incidental / non-optimized capability for complementary missions

Synergistic Missions

Suppression / Destruction of Enemy Air Defenses (SEAD/DEAD)

Strategic Attack (SA)

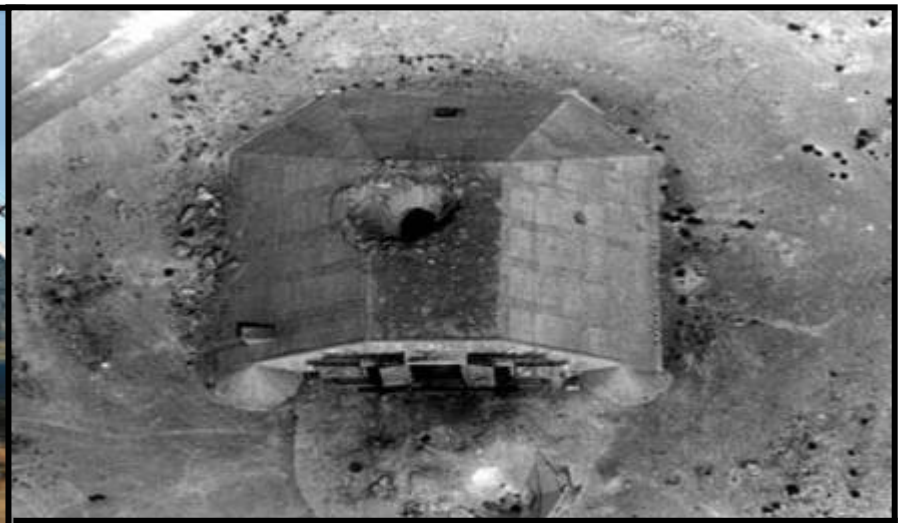
Unique capabilities combine to accomplish mission they could not do alone

Common Mission Elements

Intelligence, Surveillance and Reconnaissance (ISR)

Electronic Attack (EA)

Capability Gaps



Moving Target Capability

Risk Mitigation

PELE

LJDAM

L-Mav

Future

(Adverse WX, High Threat)

Today

(Clear WX, Low Threat)

Capability Gap

SDB II

Hellfire

Gun / Ammo

LGB

Maverick

07 08 09 10 11 12 13 14 15

Hardened / Deeply Buried

Combat ID


CFT
File Navigate Layers Help
AL TAQADDUM
AL TAJI
BAGHDAD
BAGHDAD MUTHENNA
SALMAN PAK EAST
AL ISKANDARIYAH NEW
KARBALA NORTHEAST
AN NUMANIYAH
UBAYDAH BIN AL JARRAH
AL HAYY
NEJEF NEW
KUT AL HAYY EAST
AMARA NEW
QALAT SIKAR
WADI AL KHIRR NEW
SHATRA
DEZFUL HIGHWAY STRIP
ABOANAN
HIGHWAY STRIP
Center Unit
MOBILE-06
Msgs
Msg Box
Admin

Lowering Collateral Damage

Challenges Ahead

One Joint Fight...

Precision Weapons Procurement

July 10, 2007

CAPT Peter D. Murphy, USN
Deputy Executive Officer for Naval Aviation and Tactical Air Systems, OUSD(AT&L)A&T Portfolio Systems Acquisition, Air Warfare

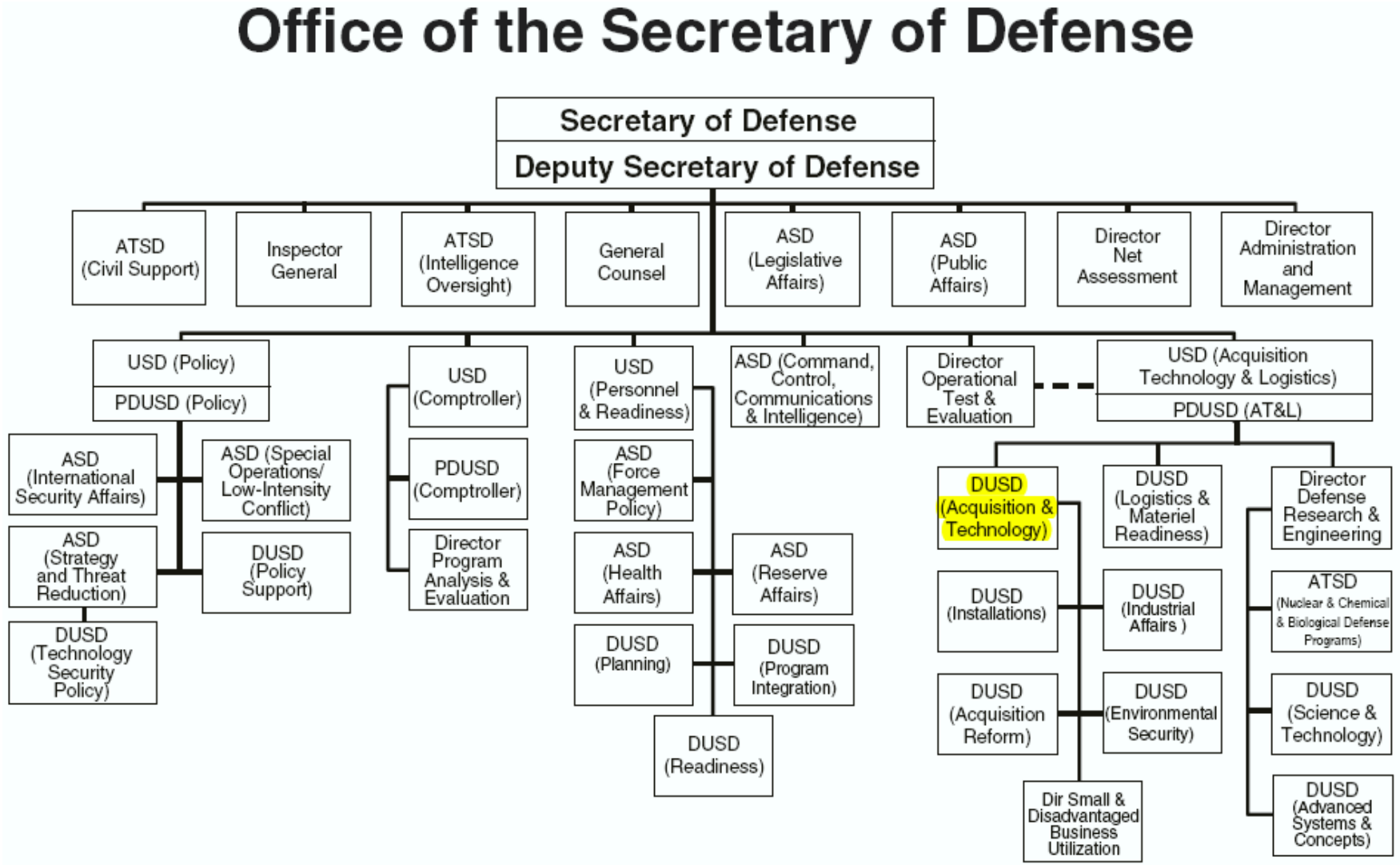
Agenda

Precision Weapons – An OSD Perspective

- OSD Organization
  - Strategic Guidance
- Precision Weapons
  - Defined
  - Costs / Types / Attributes
  - Programmatic Concerns
- Requirements & Acquisition Process in transition
- Joint Capability Areas
- 2007 Defense Acquisition Reform Proposal
- Final Thoughts
- Q&A’s

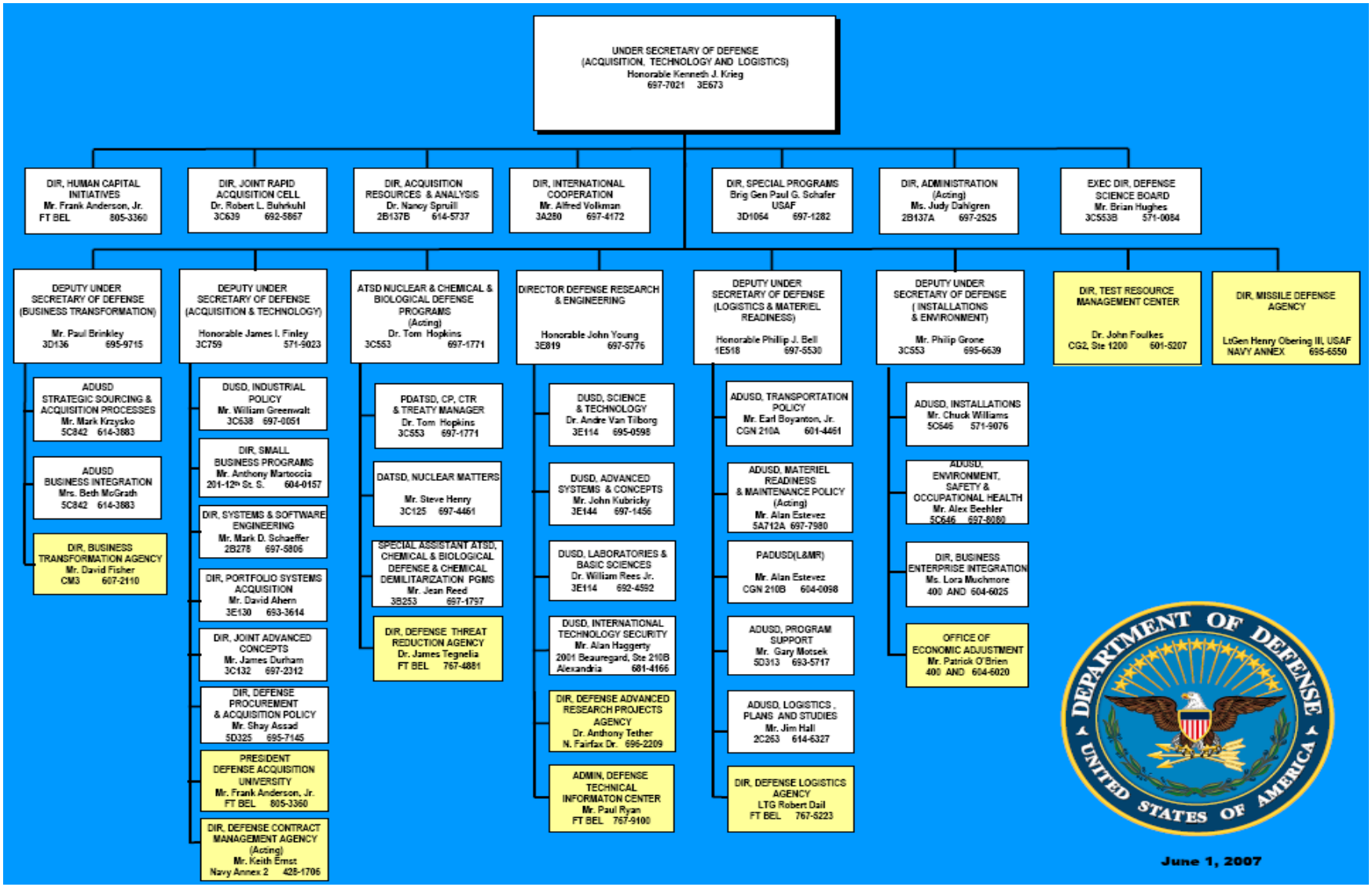
OSD Directorate

Precision Weapons – An OSD Perspective



USD(AT&L) Directorate

Precision Weapons – An OSD Perspective



USD(AT&L) Strategic Guidance for 2007

Precision Weapons – An OSD Perspective

The Department must:

- Be responsive to its stakeholders, including the President, the joint warfighter, and the American taxpayer
- Provide the information and analysis necessary to make timely and well-reasoned decisions
- Undertake reforms to reduce redundancies and ensure the efficient flow of business processes

Support to the joint warfighter is the primary basis of our effectiveness metrics—and to that end, DoD is integrating capability, analysis, and resource processes that support joint solutions. Initiatives along these lines include:

- Common databases, analytic methods, and information sources to support decisions
- Early collaboration on investment decisions, between the joint warfighter, acquisition, sustainment, and resource communities
- Resource “break-out” along “joint capability area” lines
- Capital Budgeting for Major Acquisition Programs to increase accountability within the budget allocation process

Precision Weapon - Defined

Precision Weapons – An OSD Perspective

- Precision Weapon (Merriam-Webster)
  - Precision: The state or quality of being precise; exactness
  - Weapon: An instrument of attack or defense in combat, as a gun, missile, or sword

- Precision Weapons provide the capability of accurately and rapidly engaging (high-value) targets with reliability, from short and long stand-off distances for mission accomplishment, while at the same time minimizing collateral damage. (Defence R&D Canada)

- This article proposes that a *precision weapon* be defined as a tactical capability providing measurable and quantifiable first-order effects and minimal unintended or undesirable effects. The intent is to focus specifically on the preciseness of the effect the weapon achieves and not the precision that relates to its guidance-system accuracy. (Air & Space Power Journal – Spring 2006)

Cost of Precision Weapons

Precision Weapons – An OSD Perspective

- In the summer of 1944, 47 B-29's raided the Yawata steel works from bases in China; only one plane actually hit the target area, and only with one of its bombs. This single 500 lb. general purpose bomb represented one quarter of one percent of the 376 bombs dropped over Yawata on that mission.

- It took 108 B-17 bombers, crewed by 1,080 airmen, dropping 648 bombs to guarantee a 96 percent chance of getting just two hits inside a 400 x 500 ft. German power-generation plant

- In contrast, in the Gulf War, a single strike aircraft with one or two crewmen, dropping two laser-guided bombs, could achieve the same results with essentially a 100 percent expectation of hitting the target, short of a material failure of the bombs themselves.

Types of Precision Weapons

Precision Weapons – An OSD Perspective

- Bullets
- Magnetic
- Pressure
- Acoustic & Seismic
- Wire-Guided
- Electro-optic
- Infrared
- Laser Guided
- RF Guided
- Home on RF Energy
- RF Controlled
- Internal Navigation System
- Terrain Contour Matching (TERCOM) radar guidance
- Digital Scene Matching Area Correlation (DSMAC)
- Global Positioning System
- Scene matching
- Directed Energy
- Enhanced Sensor Technology
- New / Next Generation?

Precision Weapon System Attributes

Precision Weapons – An OSD Perspective

- Increases / Improves
  - Accuracy
  - Efficiency
  - Standoff
  - Response time
  - Accessibility
  - Reliability (neutralize target)
  - All weather capability
  - Persistence
- Reduces
  - Collateral Damage
  - Footprint
  - Logistics chain
  - Training requirement
  - Redundancy
  - Launch sites / platforms
  - Manpower
  - Firepower required
  - Risk to friendly / attacking forces
  - Costs

Army Tactical Missile System

Precision Weapon System Attributes

Precision Weapons – An OSD Perspective

Small Diameter Bomb

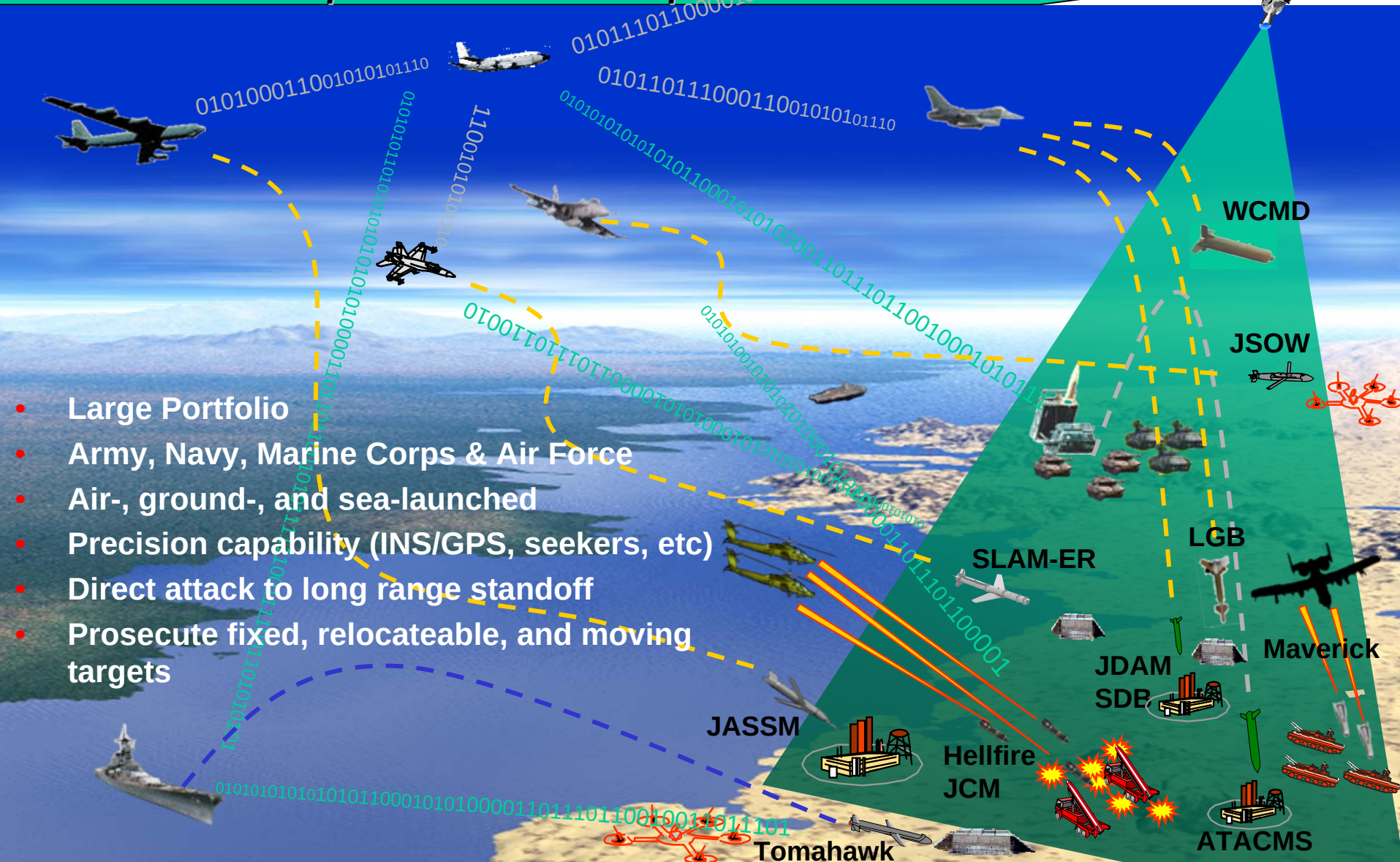
- Potential Improvements
  - Multiple mission flexibility
  - Warhead / fuze sensitivity
  - Data transfer / update
  - Speed of decision / delivery
  - Battle Damage Assessment
  - Affordability (weapon vs. platform/system)
  - Weapon speed, range & penetration
  - Loiter
  - Moving target capability
  - Command & Control
  - Interoperability
  - Non-kinetic options
  - Intel Collection / Dissemination

Precision Weapons Attack Portfolio

GPS & Comm

ISR

Precision Weapons – An OSD Perspective



- Large Portfolio
- Army, Navy, Marine Corps & Air Force
- Air-, ground-, and sea-launched
- Precision capability (INS/GPS, seekers, etc)
- Direct attack to long range standoff
- Prosecute fixed, relocateable, and moving targets

DoD Cross-Weapon Programmatic Issues

Precision Weapons – An OSD Perspective

- GPS upgrades
- Selective Availability Anti-Spoofing Module (SAASM)
- Fuzes
- Anti-tamper
- Sustainment and logistics; identification tags
- Insensitive Munitions (IM)
- Variable warhead/energetics
- Battlespace awareness
- Munitions Requirements Process
- Thermal batteries
- Unexploded ordnance
- Weapons data-links
- Targeting; Battle Damage Assessment (BDA)
- Weapons Operational Test Assessments
- Universal Armament Interface (UAI)
- Test and training ranges
- Industrial base/production strategies

What We Need to Do Better?

Precision Weapons – An OSD Perspective

Requirements

- Adapting to changing conditions
- Matching operational needs with systems solutions
- Overcoming biases/stovepipes
- Moving to transform military

Budget/Resources

- Laying analytical foundation for budget
- Aligning budgets with acquisition decisions

Acquisition

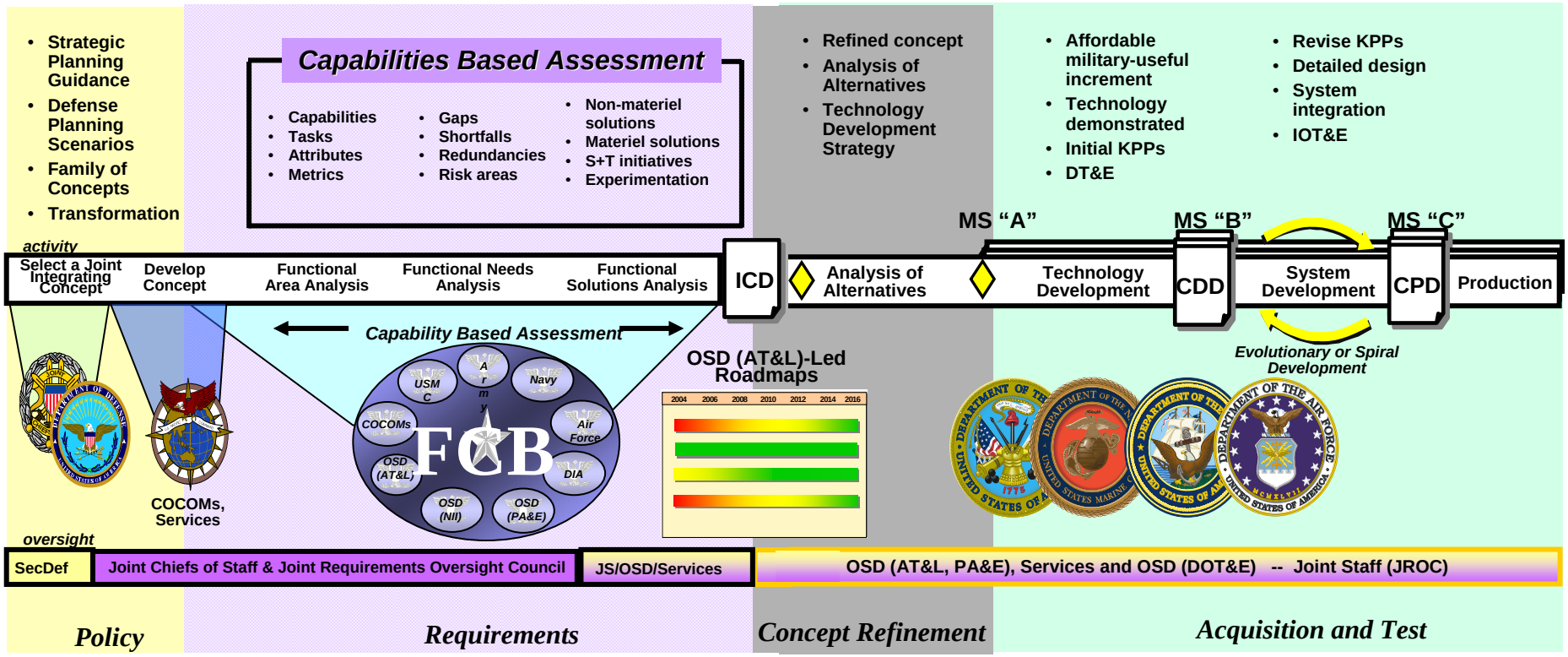
- Acquiring systems-of-systems
- Making system decisions in a joint, mission context
- Transitioning technology
- Assessing complexity of new work and ability to perform it
- Controlling schedule and cost
- Passing operational tests
- Ensuring a robust industrial base

Sustainment

- Controlling Operations & Support costs
- Reducing logistics tails

DOD Requirement to Production Process

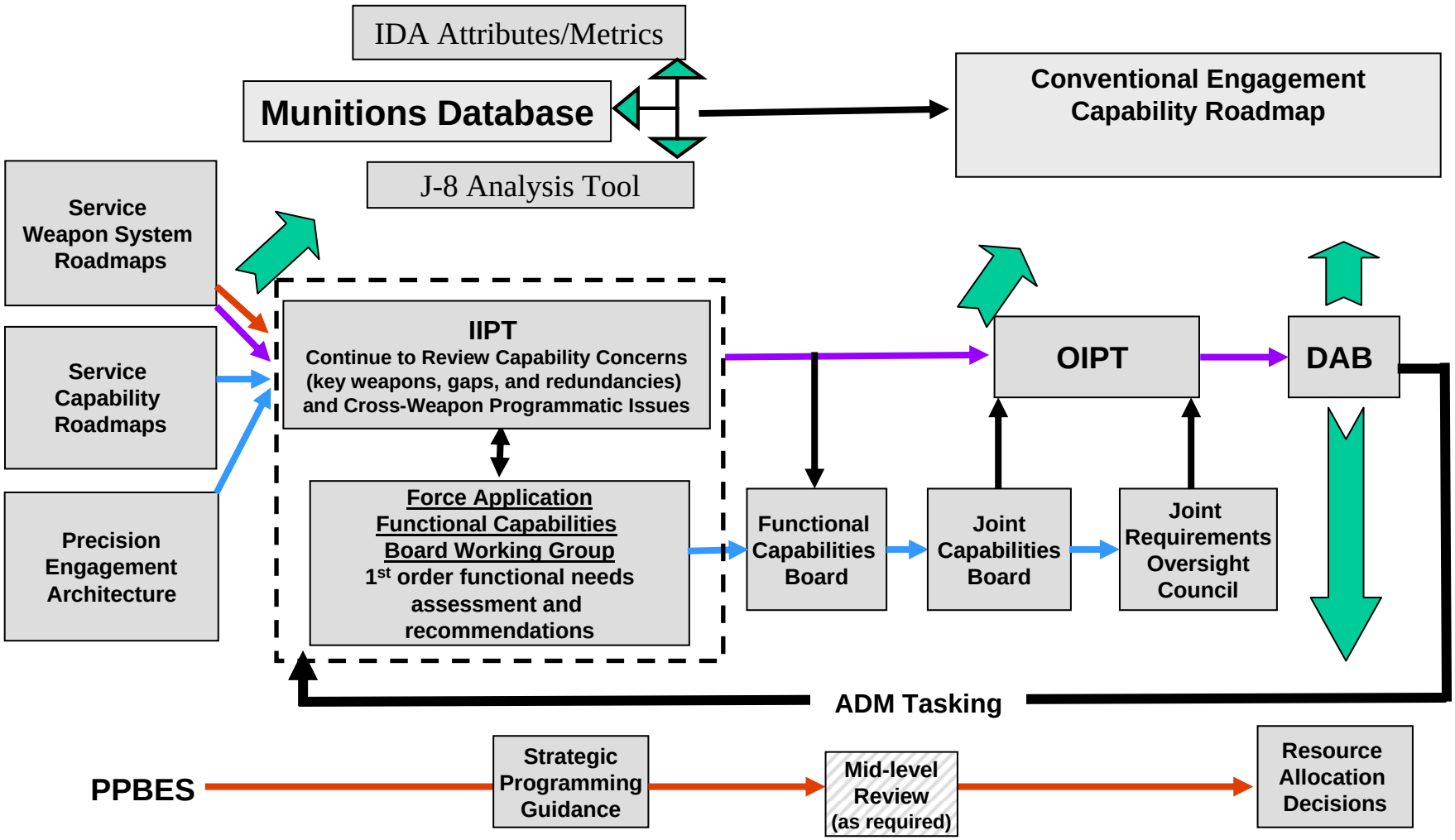
Precision Weapons – An OSD Perspective



*** Per DoDI 5000 and CJCSI 3170**

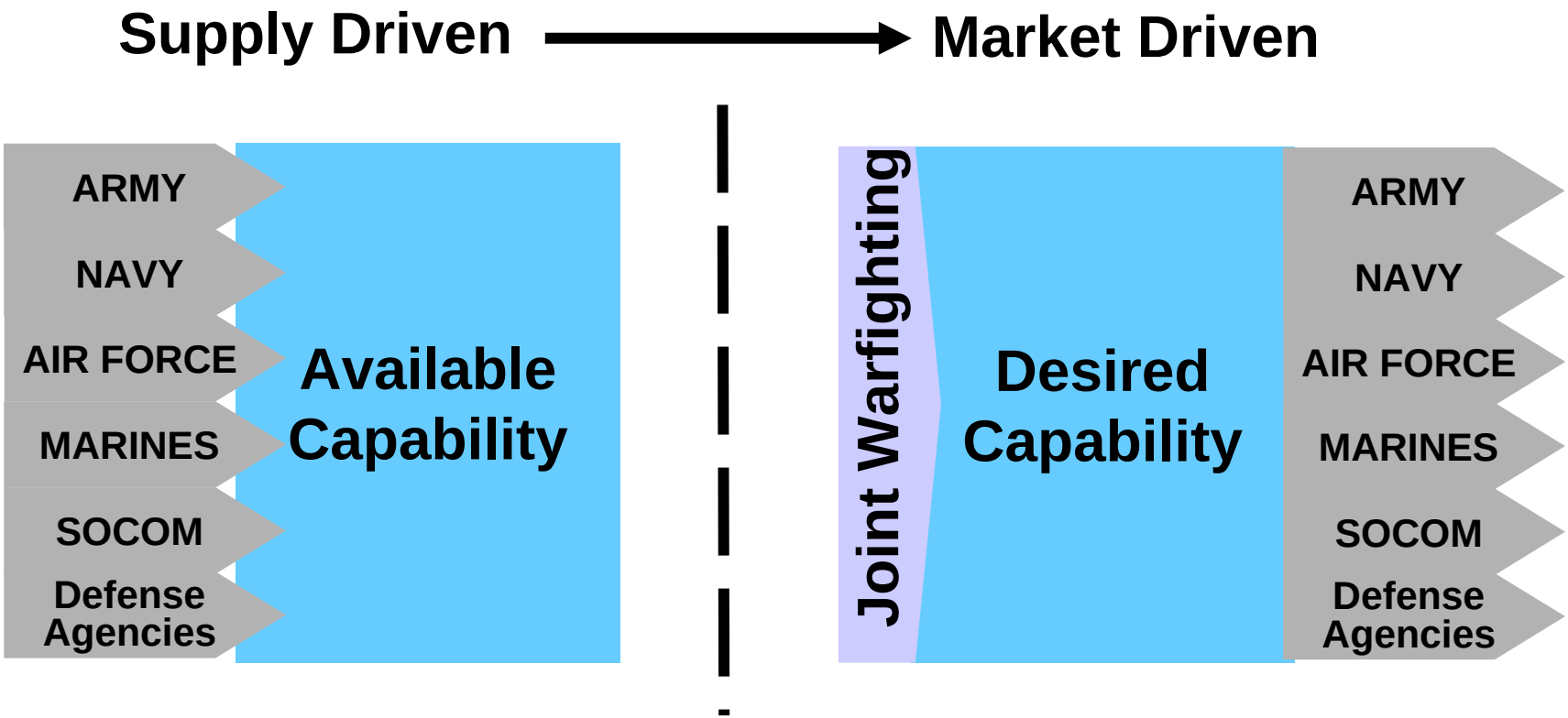
Weapon Review Process Flow

Precision Weapons – An OSD Perspective



Customer Driven Enterprise

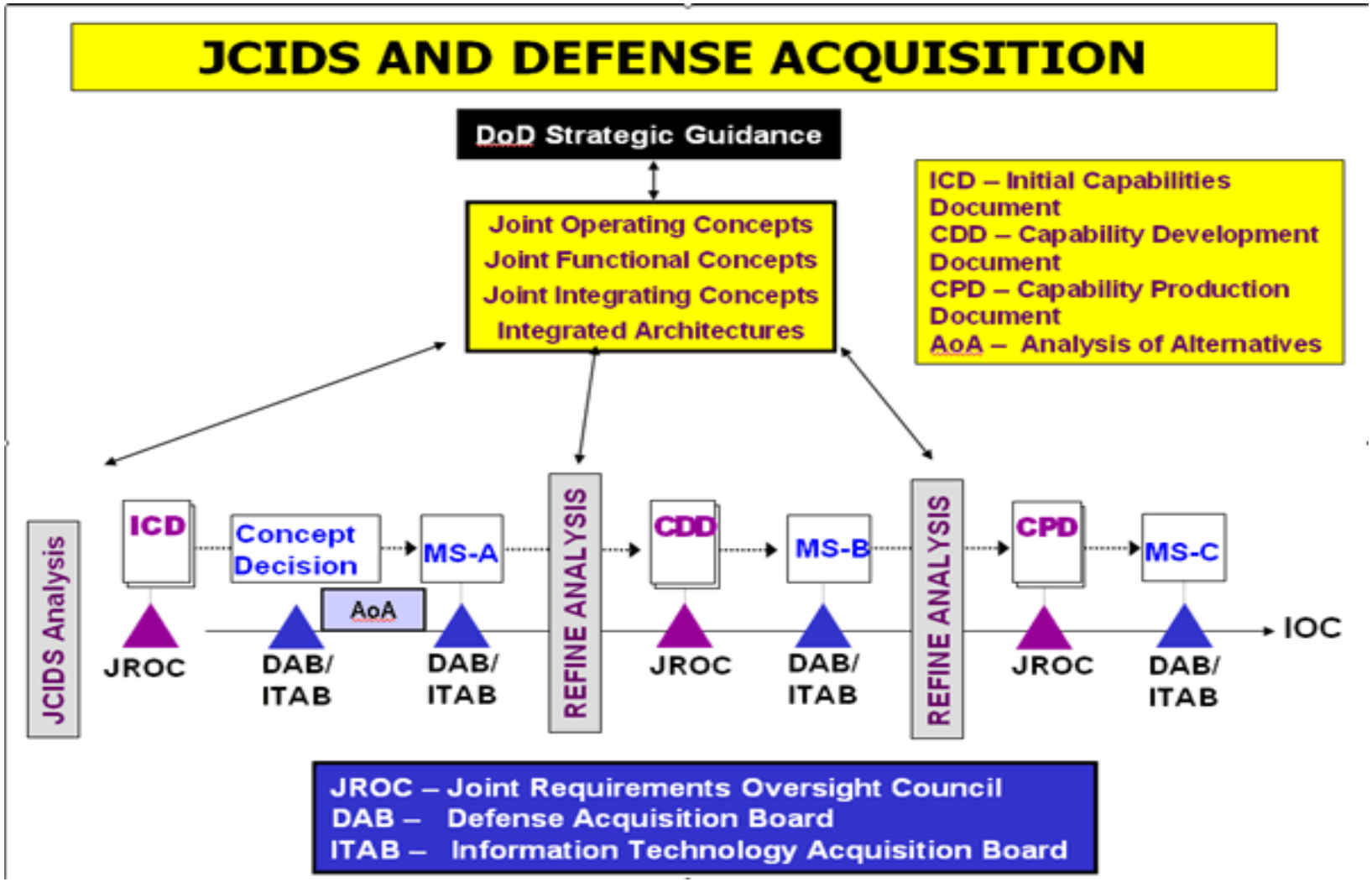
Precision Weapons – An OSD Perspective



Maximize warfighting effectiveness through TJS and OSD synergy

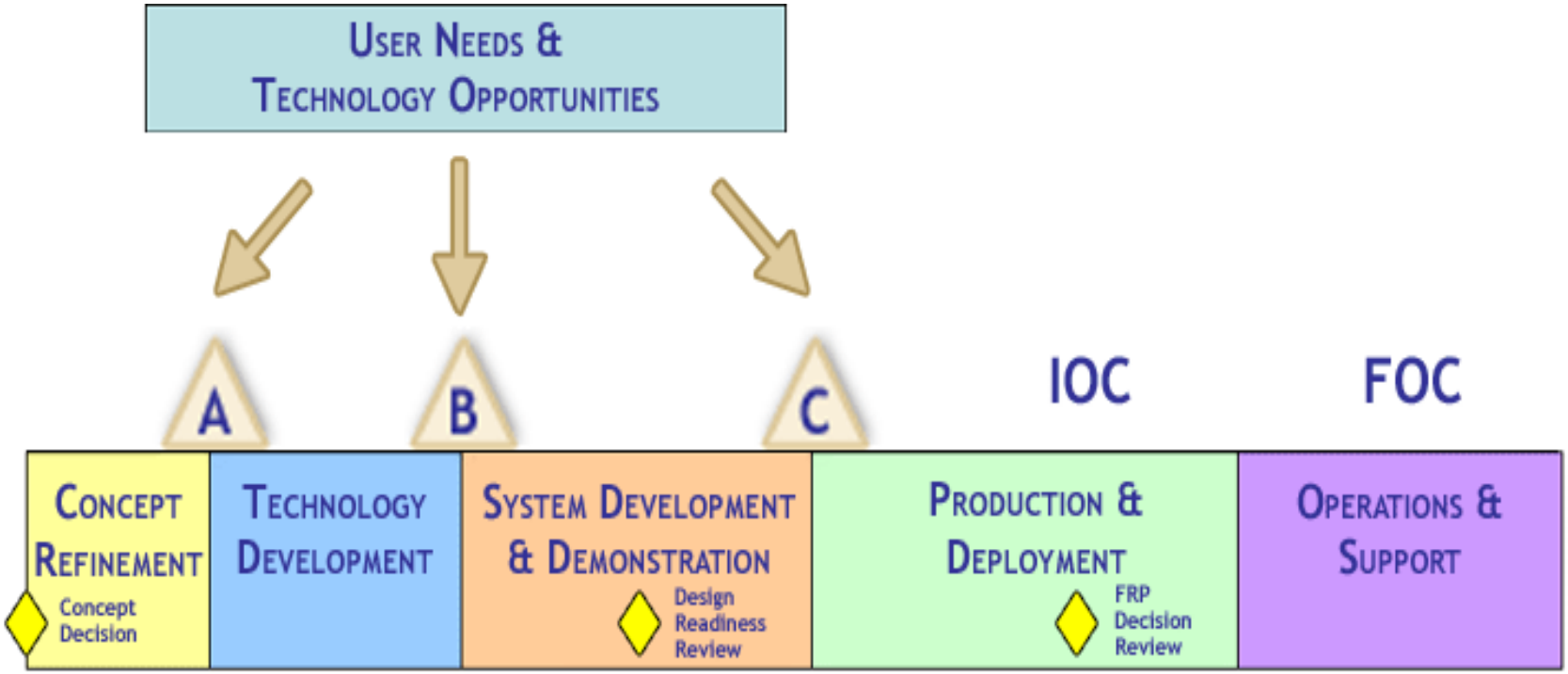
Joint Capabilities Integration and Development System (JCIDS)

Precision Weapons – An OSD Perspective



Defense Acquisition Management Framework

Precision Weapons – An OSD Perspective



- **Process entry at Milestone A, B or C**
- **Entrance criteria meet before entering phase**
- **Evolutionary Acquisition or Single Step to Full Capability**

Defense Acquisition Functional/Topic View

Precision Weapons – An OSD Perspective

Joint Capability Areas (JCAs) – Tier 1

Precision Weapons – An OSD Perspective

- Joint Force Generation
- Joint Force Management
- Joint Battlespace Awareness
- Joint Command and Control
- Joint Net-Centric Operations
- Joint Public Affairs Coordination
- Joint Interagency / ICO / NGO Coordination
- Joint Protection
- Joint Logistics
- Defense Support of Civil Authorities
- Joint Homeland Defense
- Joint Global Deterrence
- Joint Shaping
- Joint Stability Operations
- Joint Information Operations
- Joint Access & Access Denial Ops
- Joint Special Operations & Irregular Operations
- Joint Land Operations
- Joint Maritime / Littoral Operations
- Joint Air Operations
- Joint Space Operations

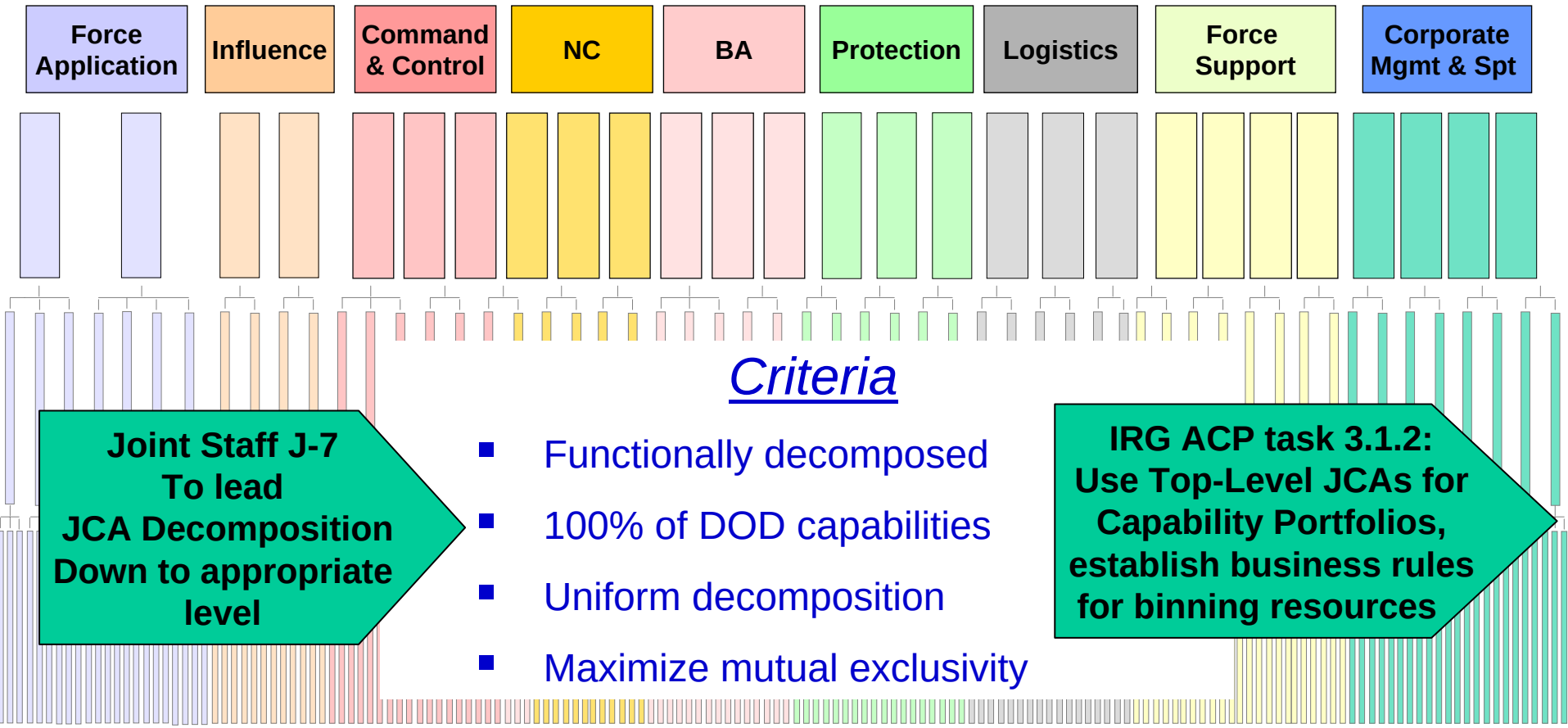
New Top Level JCAs & Definitions

Precision Weapons – An OSD Perspective

Force Application	**Definition:** The ability to maneuver and engage the enemy to create the effects necessary to achieve mission objectives.
Influence	**Definition:** The ability to shape the decisions, actions, and/or perceptions of key foreign leaders & populations by delivering thematic messages & conducting activities to advance the interests of the USG and its key partners, while strengthening key U.S. international relationships.
Command & Control	**Definition:** The ability to exercise authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission.
Net-centric	**Definition:** The ability to exploit all human and technical elements of the joint force and its mission partners by fully integrating collected information, awareness, knowledge, experience, and decision making, enabled by secure access and distribution.
Battlespace Awareness	**Definition:** The ability to develop and share situational awareness and to produce intelligence through persistent and pervasive observation of all domains.
Protection	**Definition:** The ability to prevent/mitigate adverse effects of attacks on personnel (combatant/non-combatant) and physical assets of the United States, allies and friends.
Logistics	**Definition:** The ability to project & sustain the operational readiness of the joint force through deliberate sharing of National and multi-national resources to support operations, extend operational reach and provide the joint force commander freedom of action necessary to meet mission objectives.
Force Support	**Definition:** The ability to maintain personnel readiness, establish and field mission ready joint organizations, and provide, operate, and maintain capable installation assets across the total force to ensure needed capabilities are available to enable the National Defense Strategy.
Corporate Mgmt & Support	**Definition:** The ability to govern and administer the Department's activities which establish strategic direction and provide common support to force employers, managers and developers.

JCA Decomposition - Team Effort

Precision Weapons – An OSD Perspective



Joint Staff J-7 To lead JCA Decomposition Down to appropriate level

Criteria

- Functionally decomposed
- 100% of DOD capabilities
- Uniform decomposition
- Maximize mutual exclusivity

IRG ACP task 3.1.2: Use Top-Level JCAs for Capability Portfolios, establish business rules for binning resources

Capability based approach to manage risk, conduct trades and better enable strategic choice across the enterprise.

Defense Acquisition Reform Act 2007

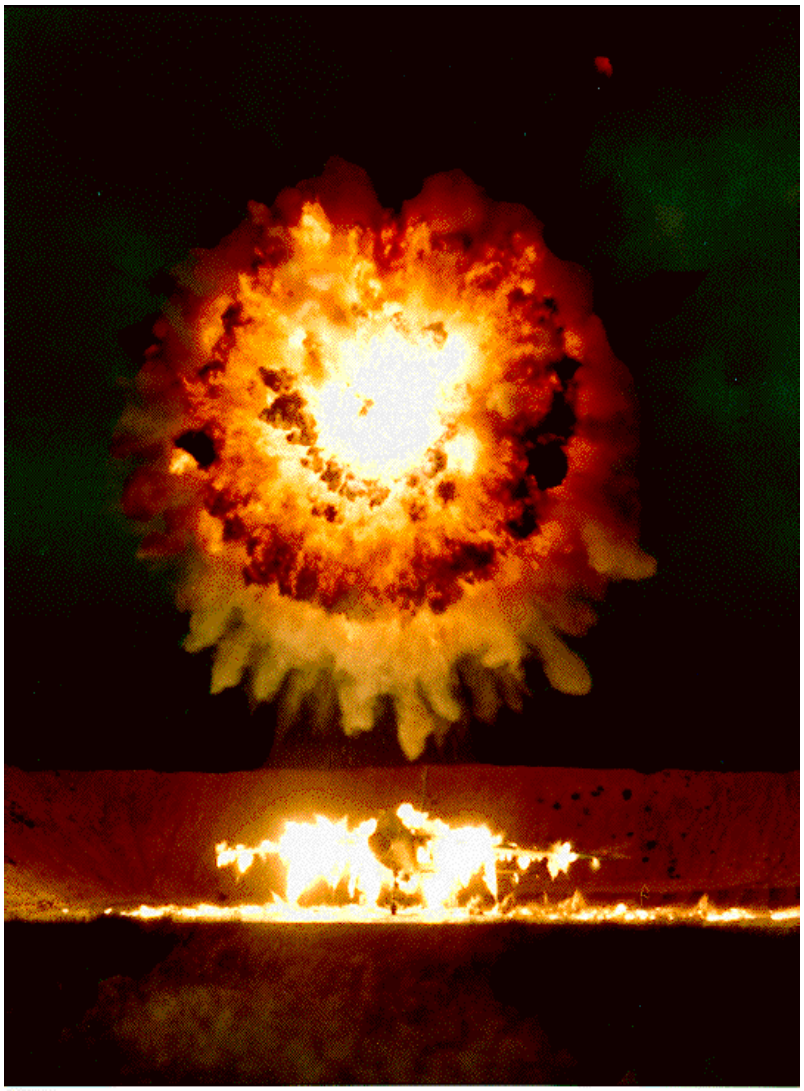
Precision Weapons – An OSD Perspective

- Senator McCain: “despite the lessons of the past, the acquisition process continues to be dysfunctional”
- Submitted to the Senate Armed Services Committee
  - Expand membership of the Joint Requirement Oversight Council (JROC)
    - Undersecretary of Defense for Acquisition, Technology & Logistics, and Undersecretary of Defense (Comptroller)
    - Include Director of Program Analysis & Evaluation as an advisor
  - Forbids Service Secretaries from reprogramming funds into Major Defense Acquisition Programs (MDAPs) without JROC assessment
  - Comptroller General to establish a new Office of Independent Assessment (cost estimates & new MDAP milestone system)

Final Thoughts

- Precision Strike isn't platform dependent
  - Aircraft, Helicopter, UAS, ship, submarine, tank & artillery, etc..
- Precision Strike isn't launch environment dependent
  - Air, surface(dry/wet) or subsurface
- Must complete detailed capability assessment
  - Collateral Damage, Guidance, Networked, Environment, Flight Out Profile, Countermeasures, Operational Flexibility, Responsiveness, Maximum Effective Range, Employment Means, Internal Carriage, Single Shot Probability of Kill (SSpk)
- Need more options
  - Fuzing, seeker, sensing, range, variable speed, loiter, size, multi-service command & control, multi-environment capable, damage assessment
- JCIDS process, JCA developments & 2007 Defense Acquisition Reform proposal are progressive and necessary
  - Must become more Joint / Combatant Commander centric and less Service focused

Q&A's / Contact Information



Questions?

CAPT Pete Murphy, USN

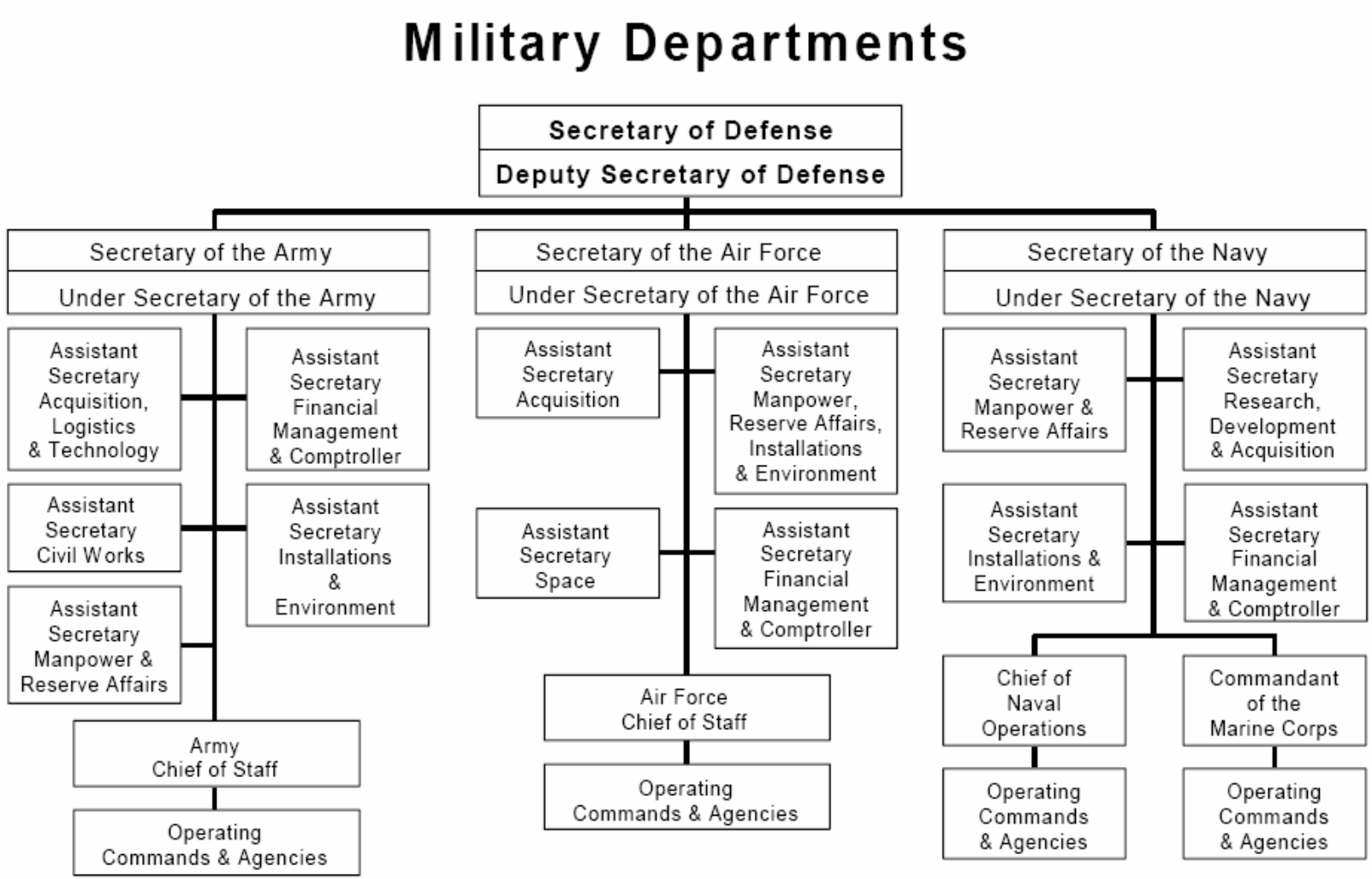
Pentagon Office: 3E1081

Peter.Murphy@osd.mil

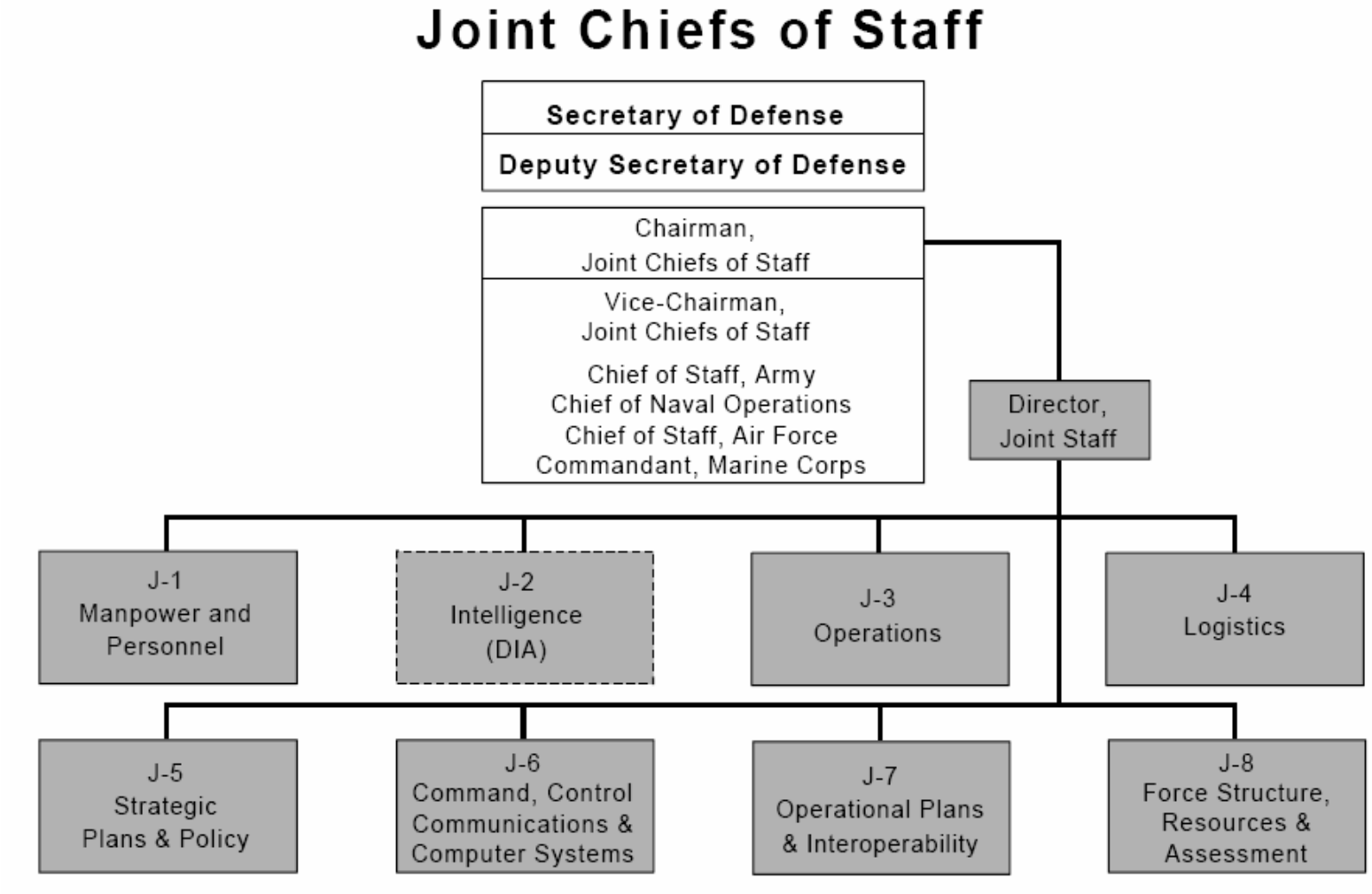
(703) 695-3015

DoD - Military Department Structure

Precision Weapons – An OSD Perspective

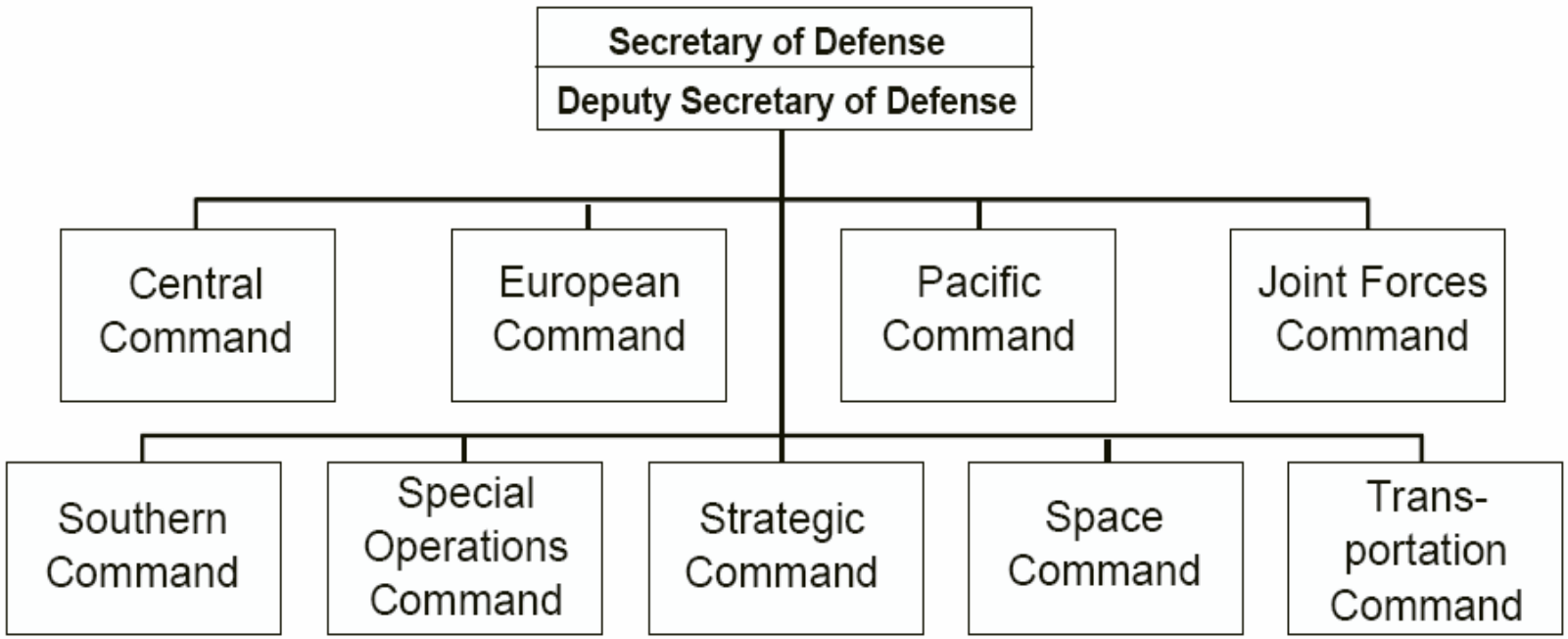


DoD - Joint Staff Structure



DoD - Unified Combatant Command Structure

Unified Combatant Commands



PRECISION STRIKE ASSOCIATION

Precision Strike Summer Forum
"Joint Perspectives on Precision Engagement"
July 10-11, 2007

Virginia Beach Resort Hotel
2800 Shore Drive
Virginia Beach, VA 23451

TUESDAY, JULY 10 2007

JOINT TESTING IN A VIRTUAL AND LIVE ENVIRONMENT
Colonel Eileen Bjorkman, USAF—Test Director, Joint Test Evaluation Methodology, Office of the Director of Operational Test & Evaluation (DOT&E), OSD

ARMY PRECISION ENGAGEMENT
Al Resnick—Director of Requirements Integration, U.S. Army Training and Doctrine Command

ARMED UNMANNED SYSTEMS: A PERSPECTIVE ON NAVY NEEDS, CHALLENGES AND VISION
Rear Admiral T. Heely, USN—Program Executive Officer for Strike Weapons and Unmanned Aviation (PEO (W))

PRECISION WEAPONS FROM THE OSD PERSPECTIVE
Captain Peter Murphy, USN—Office of the Under Secretary of Defense (AT&L) Portfolio Systems Acquisition (Air Warfare)

SEA STRIKE—PRECISION ENGAGEMENT FOR THE FLEET TODAY
Captain Scott Stearney, USN—Commander, Carrier Air Group
(Presentation not approved for distribution)

WEDNESDAY, JULY 11 2007

KEYNOTE ADDRESS: JOINT PERSPECTIVE ON PRECISION ENGAGEMENT
Major General "Mike" Hostage III, USAF— Director for Requirements and Integration (J8), U.S. Joint Forces Command

THE U.S. ARMY'S PRECISION STRIKE WEAPONS, DEVELOPING SYSTEMS AND LESSONS LEARNED
- **James Sutton**—U.S. Army, Deputy Program Executive Officer, Ammunition, Picatinny Arsenal
- **Sam Coffman**—Director Futures Center, Fort Sill

STATE OF PRECISION ENGAGEMENT IN THE U.S AIR FORCE
Major General David Clary, USAF—Vice Commander Air Combat Command (ACC), Langley Air Force Base

AIR FORCE PRECISION STRIKE WEAPONS DEVELOPMENT STATUS
Colonel Richard Justice, USAF—Commander of the Miniature Munitions Systems Group (MMSG), Eglin Air Force Base

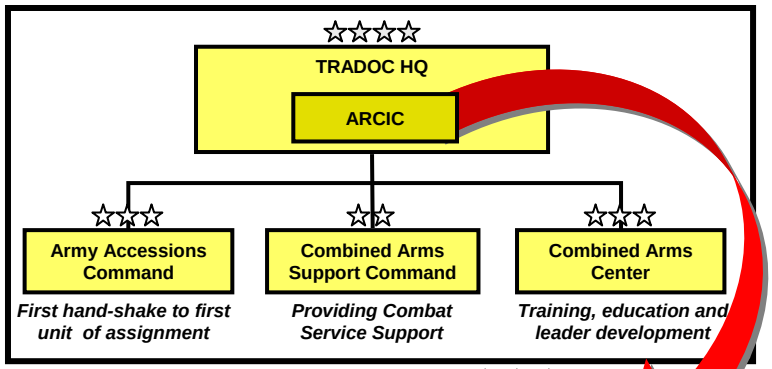
UAS ROADMAP
Dyke Weatherington—Deputy, UAS Planning Task Force, Office of the Under Secretary of Defense (AT&L), OSD **(approval to distribute not received, will post if it becomes available)**

Future Modular Force
Strike Concept
and
Precision Munitions

10 July 2007

Allan Resnick, SES
Director, Capabilities Development and Analysis
Army Capabilities Integration Center
US Army Training and Doctrine Command

Army Capabilities Integration Center

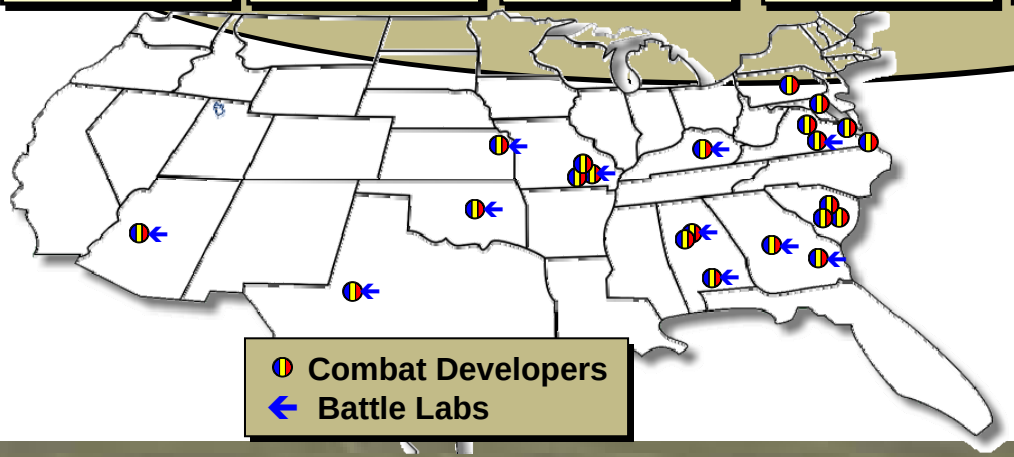


The Army Capabilities Integration Center designs, develops, integrates and synchronizes force capabilities for the Army across the DOTMLPF imperatives into a Joint, Interagency, and Multinational operational environment from concept through capability development.

ARCIC

ARCIC Forward

- Concept Developments & Experimentation
- Accelerated & Development
- Capabilities Development & Analysis
- Future Force Integration
- International Army Programs
- Architecture Integration Management
- Force Design

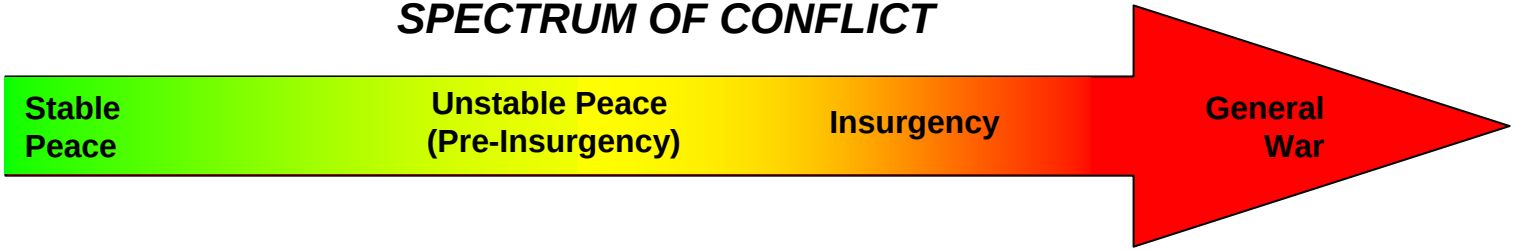


- Air Land Sea Application
- JFCOM LNO

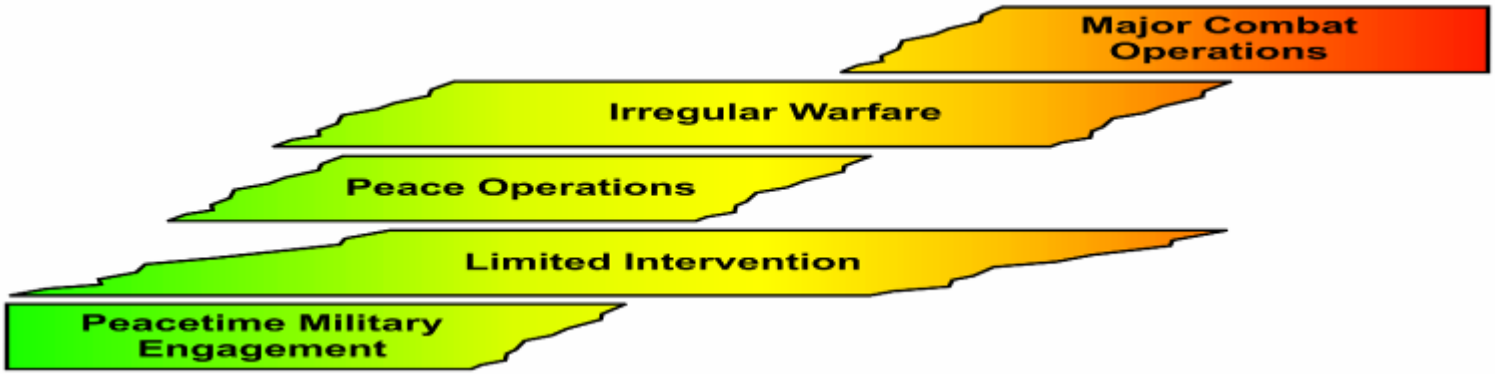
Service LNOs

Spectrum of Operations in 21st Century

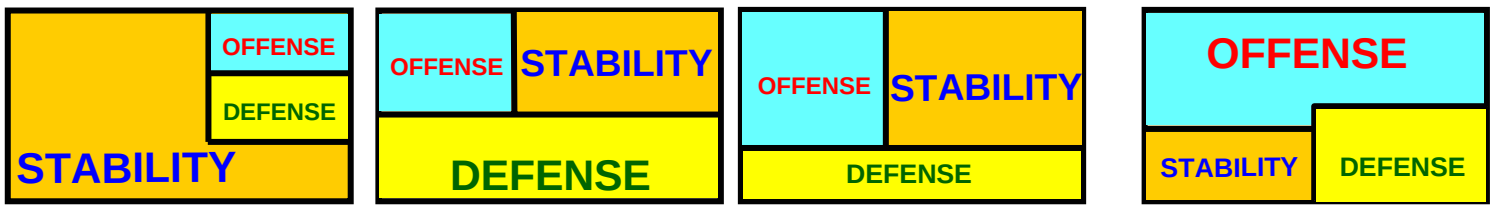
SPECTRUM OF CONFLICT



OPERATIONAL THEMES



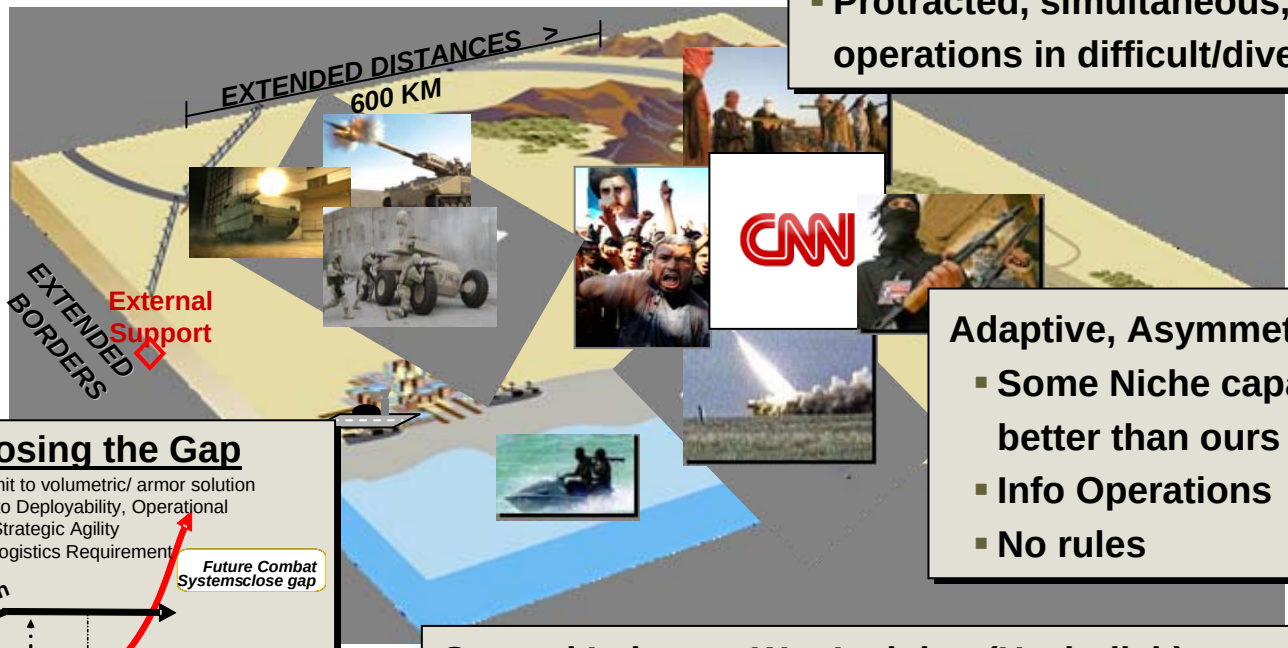
FULL SPECTRUM OPERATIONS



Who Will We Face?
Where Will We Operate?

Enemies Will Seek to:
- Deter US involvement
- Isolate US from local support or allies
- Block entrance to country or lure US into "their zone"

Operational Complexity:
- Enemies who have "gone to school" on U.S. operations
- Traditional and Irregular
- Protracted, simultaneous, full spectrum operations in difficult/diverse terrain



Adaptive, Asymmetric Threat
- Some Niche capabilities better than ours
- Info Operations
- No rules

Enemies are Closing the Gap

- Technical limit to volumetric/ armor solution
- Challenges to Deployability, Operational Maneuver, Strategic Agility
- Increasing Logistics Requirement

Second Lebanon War Insights (Hezbollah)
- Complex terrain fight in "their zone"
- Relied on low visibility and prepared defenses
- Relied on own secure lines of communication and predicted Israeli ground approaches
- Massed Rockets, ATGMs, RPGs, and Mortars (low tech new ways)

Army Concept Strategy

Wargaming and Experimentation

Capability Based Assessments (CBA)

A comprehensive set of concepts for future capabilities development

Functional Concept for Strike 2015-2024

TRADOC Pam 525-3-4 30 April 2007

THE PROBLEM

Future operational environment requires precise, responsive, integrated and interoperable fires (lethal and non-lethal) delivered from a wide range of sources (joint, interagency and multinational) at the tactical, strategic or operational level to defeat the enemy while simultaneously complementing movement, stability operations, and protection of friendly forces conducting Full Spectrum Operations.

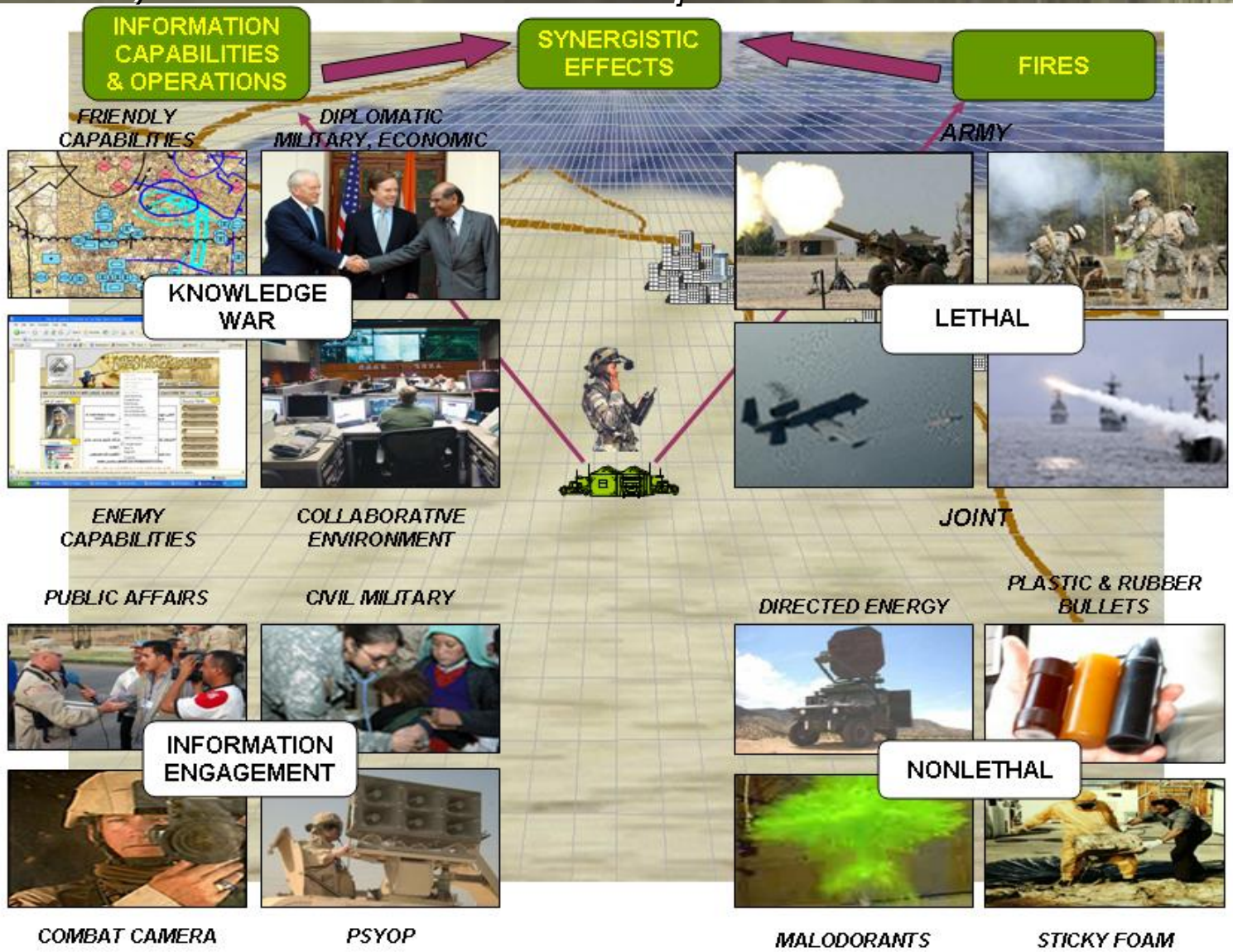
SOLUTION SYNOPSIS

- **Tailored mix** of organic and available joint, allied, and coalition strike capabilities
- **Fully integrated**, transparent communication and computer interfaces between joint fires **(lethal / non-lethal)**, command and control, and knowledge networks
- Continuous integration and employment of **networked fires** that will extend seamlessly from strategic to tactical levels and timeframes with no gaps in coverage or loss of timeliness
- **Near real-time situational awareness** to employ fires that achieve maximum desired effects
- **Advanced munitions** (lethal and non-lethal)
- Gaining and maintaining routine **access to Space**

Strike -- employment of fires in the future Modular Force, including available joint and multi-national fires, in support of Full Spectrum Operations and integration of fires with information capabilities and operations

Information Capabilities, Operations, and Fires

Strike, TRADOC Pam 525-3-4 30 April 2007



Precision Munitions Mix Analysis

Seeking Resourced Informed Solutions

Purpose: analysis of the Joint and Army precision munitions proposed for the *current and future forces* in medium and high intensity operations within Joint, Interagency, and Multinational (JIM) context to support program and funding decisions.

Problem Statement

Numerous Joint and Army precision munitions planned to support the current Heavy BCT forces and future Heavy BCT and FCS BCT forces. Army precision munitions cost estimates greatly exceed currently available and projected funding. The Army must determine what subsets (or mixes) of Army precision munitions best support the force within logistical and funding constraints.

Precision Munitions Mix Analysis
Context

Attributes: preferred mix determined based on ability to:

Threat & Environment
- Engage targets under adverse weather and countermeasure conditions.
- Engage targets under stringent ROE conditions (e.g., minimize collateral damage).

Current and Future Force
- Provide a balanced precision capability across echelons and battlefield functional areas.
- Provide a precision capability beginning FY08 and leverage munitions with best technical readiness level to minimize costs and facilitate transition between force designs.

Resources
- Meet the affordability requirements.
- Meet the logistic support capabilities of the current and future force.

- Multiple joint land operations scenarios around the globe
- More than 30 munitions candidates
- More than 180 target mission profiles

Joint, Army, and Other Services Participants

USAFAC
USAIC
USAAVNC
UAMBL
Army G3/G8
ARDEC-CSS
ARM PMO
JCM PMO
NAVSEA
NAVAIR
NLOS-LS TF
OPM Excalibur
OPM CAS
PEO Ammo
PEO Tac Missiles
PM Mortars
PM MAS
S3/PFRMS
TSM RAMS
TSM Cannon
DCSINT-Threats
USAF Doc Center
AMSAA
TRAC

Precision Munitions Mix Analysis
Methodology

A methodology to screen, explore, and develop mixes of Army precision munitions through iterative analysis and integration of results from goal programming, force on force, and resource analysis.

Front End Analysis

Operational Framework & Requirements

- *Mission Profiles*
- *Capability Packages*
- *Targets*
- *Weapons*
- *Ranked Pairings*

Screening Potential Mixes

Versatile Munitions

Versatile: The ability to achieve effects across the spectrum of the Threat target sets using diverse tactical selection criteria.

Mix Analysis

Initial Combinations

Assess Results

Force on Force Simulation (BN+) ↔ **Preferred Mixes** → **F-o-F Simulation (BCT & DIV)**

Sensitivity Analysis

Resource Analysis

- *Cost*
- *Logistic Impact*
- *Affordability*

Analysis Integration

Precision Munitions Mix Analysis
Insights

• Precision munitions are not a one-size fits all….Commanders require immediate options.

• Employment of precision munitions becomes most effective as we build and improve the future force network.

• Current and Future Forces (HBCT and FBCT) will be able to accomplish their missions with *a subset* of the Army's collection of precision munitions programs.

• Employing a subset of Army precision munitions causes greater reliance on joint capabilities (i.e. increased joint interdependence).

• Select Army Precision Munitions provided broadest utility across range of military operations (e.g. Hellfire)

• Select mixes *reduced* the overall *logistics burden*.

• Effectiveness and affordability will drive changes to *program quantities and production schedules*.

Way Ahead
U.S. Army Modernization Strategy

Network

- ✓ On the move
- ✓ Multi Layered Network
- ✓ Joint Integrated
- ✓ Persistent, shared situational awareness

Future Combat Systems Integrating Agent for Systems of Systems

Modular Formations

- ✓ Better Protection
- ✓ Mission Effective and Efficient
- ✓ More Lethality
- ✓ Rotational, sustained presence

Soldiers and Leaders
(Mounted and Dismounted)

More

Agile, Versatile, Lethal, Survivable, Sustainable, Standardized

Joint Modular Force Attributes

- ✓ Full Spectrum Operations Capable
- ✓ Projects And Sustains In Austere Environments
- ✓ Common Operating Picture, On The Move, Down To Soldier Level
- ✓ Lethal And Integrated Small Units
- ✓ Informed, Empowered, Multi Skilled Leaders And Soldiers
- ✓ Dominant Land Force

Soldiers in Trained Formations Using Advanced Network Connected to Manned and Unmanned Ground and Air Systems

BACK UPS

Future Force Capstone Concept
"Army in Joint Operations - 2015 - 2024"
TRADOC Pam 525-3-0

THE PROBLEM

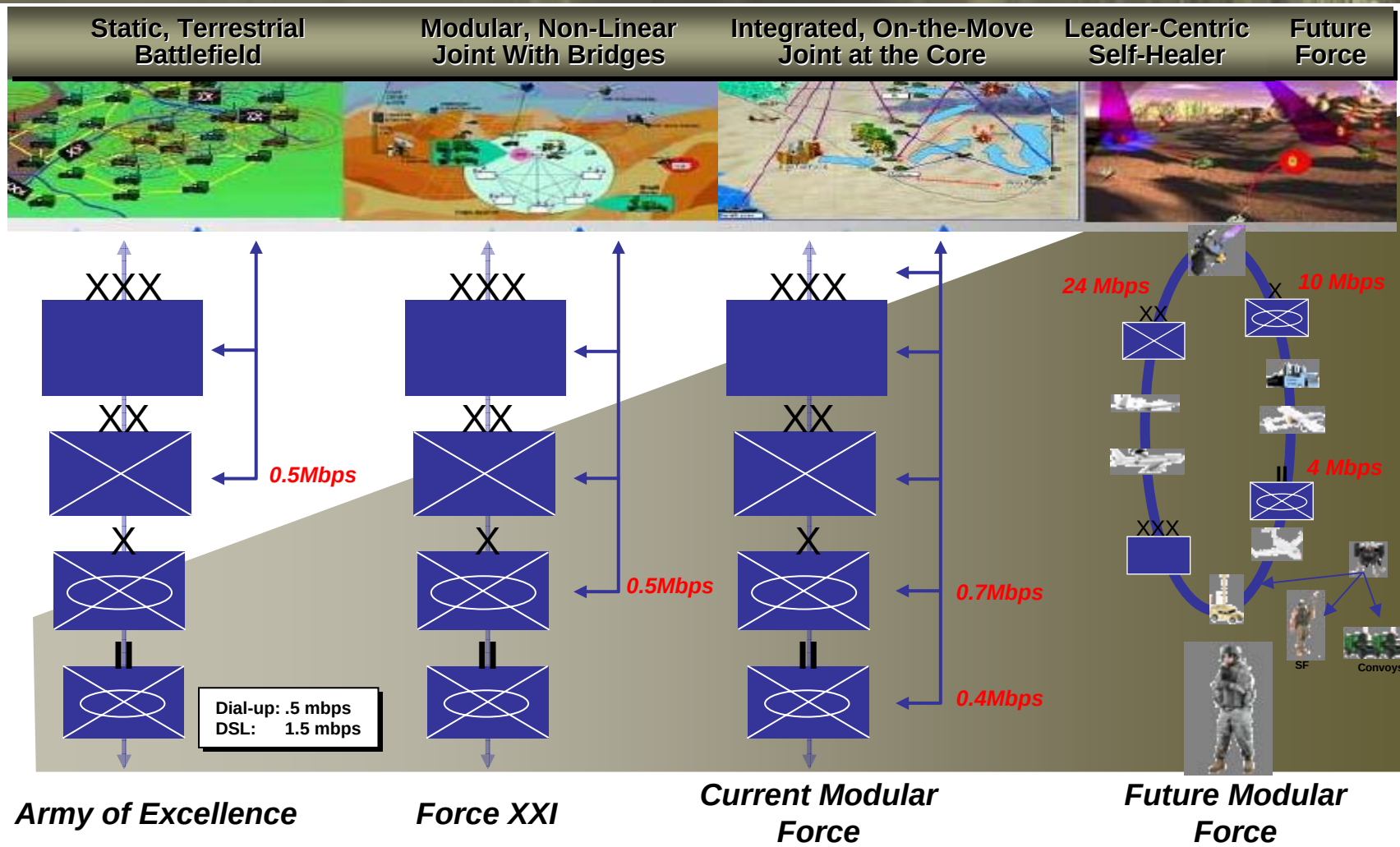
- Volatile, Uncertain, Complex, Ambiguous Strategic Environment.
- Full Spectrum Dominance Transformation Guidance.
- Complex Threats with Robust Anti-access Capabilities.
- Joint, Interagency, and Multinational Context.
- Concurrent Operational Requirements: Expeditionary Capabilities and Campaign Qualities.

SOLUTION SYNOPSIS

- Shaping and Entry Operations
- Operational Maneuver from Strategic Distances
- Intratheater Operational Maneuver
- Decisive Maneuver
- Concurrent and Subsequent Stability Operations
- Distributed Support and Sustainment
- Network-Enabled Battle Command

Key Enablers – Joint Interdependencies

Evolving Network-Enabled Battle Command



FCS BCT: Over 20x increase in ISR improves the unit's Quality of Information (See First).
The network enables Shared Situational Understanding (Understand First) and Force Effectiveness (Act First).

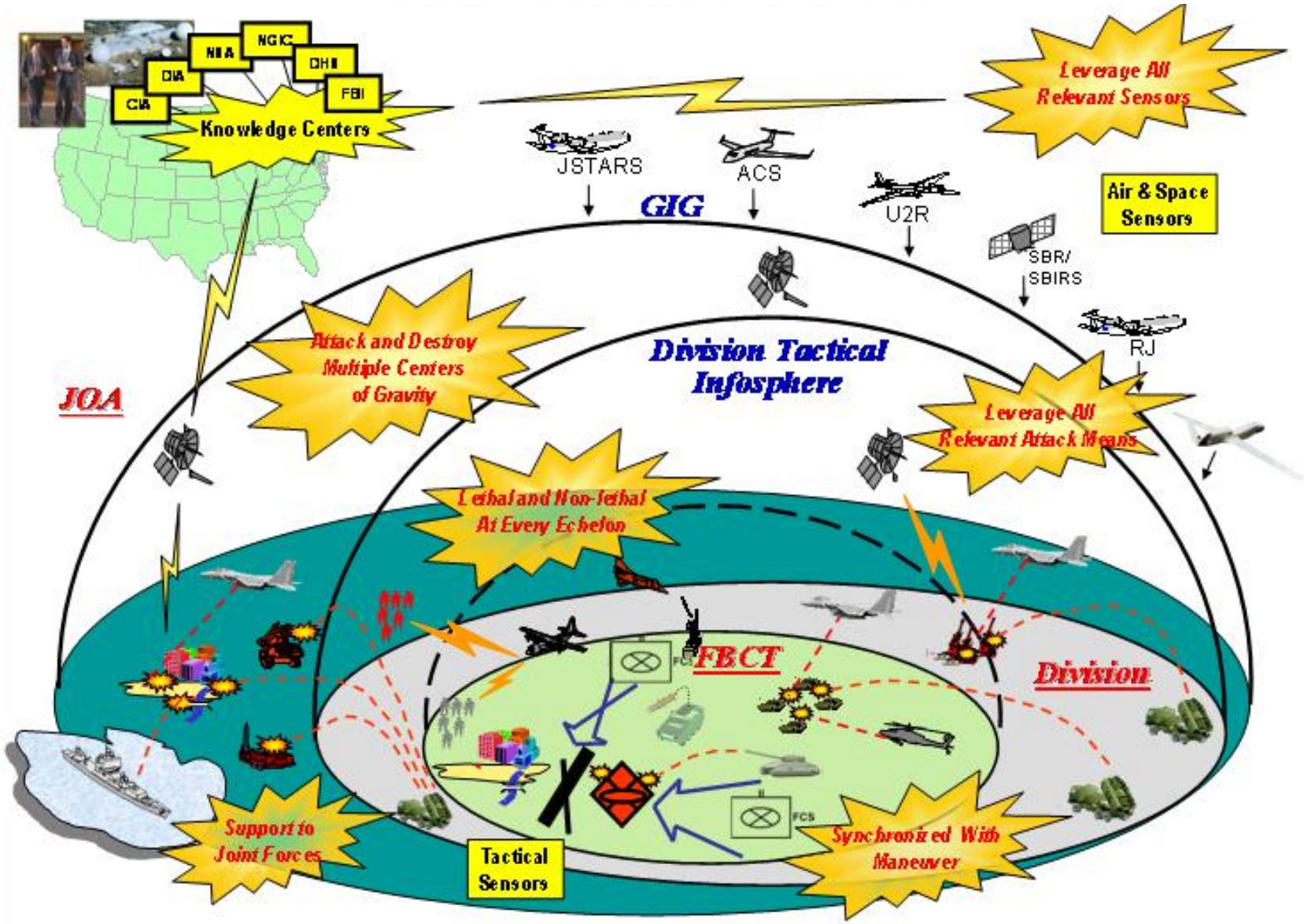
FBCT Designed for Complex Environments

Compared to Today's Heavy Brigade:

- 10X More Unmanned Assets
- 6X More Sensors . . . All Networked
- 2X More Infantry Soldiers in Squads
- 3X More Reliable and Maintainable
- Next Generation Manned Ground Vehicles
  - Increased lethality and survivability
  - Chemical/Bio Hardened
  - 360 degree hemispheric Active Protection
  - Nodes for sharing information: carries most of the sensors

Lighter, Faster, and Increased Mobility

Networked Strike



NDIA Precision Strike Summer Forum

Joint Perspectives on Precision Engagement

Presented By:
Mr. James Sutton
Deputy PEO Ammunition

11 July 2007

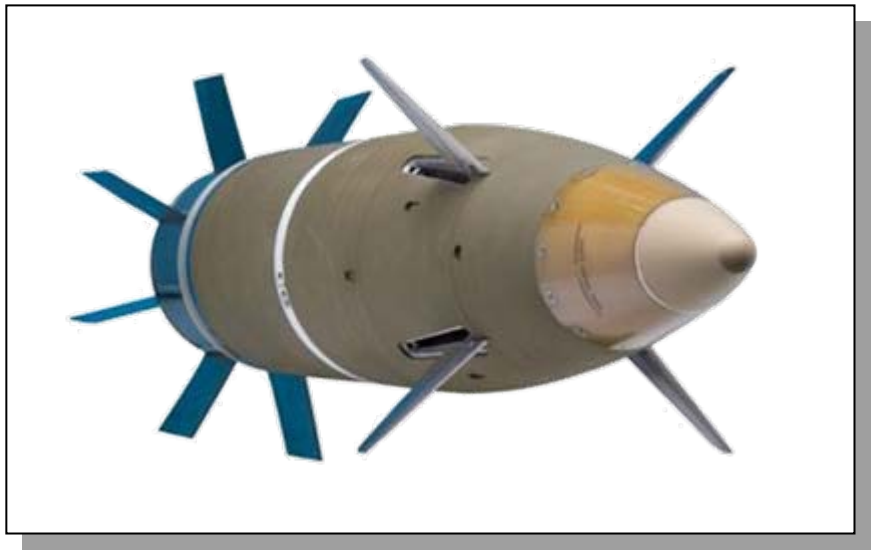
Joint Munitions & Lethality Life Cycle Management Command

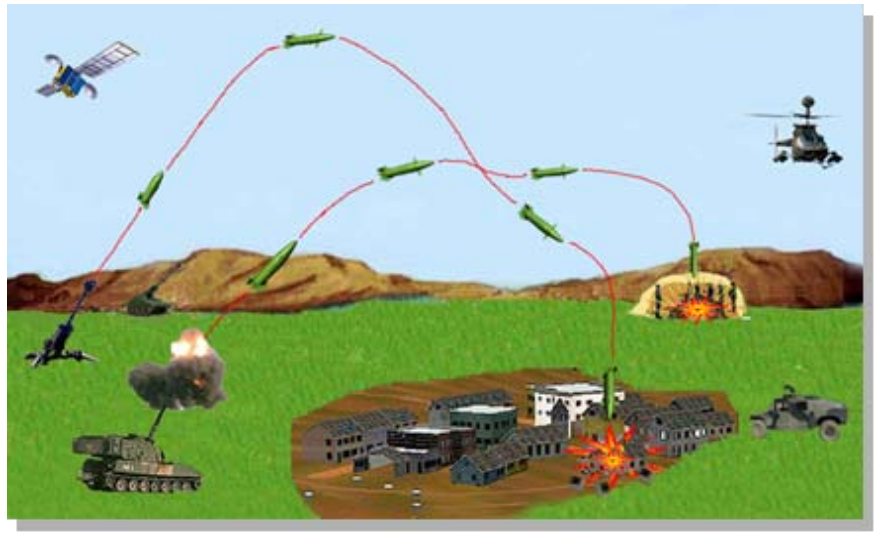
"One Team…One Fight"

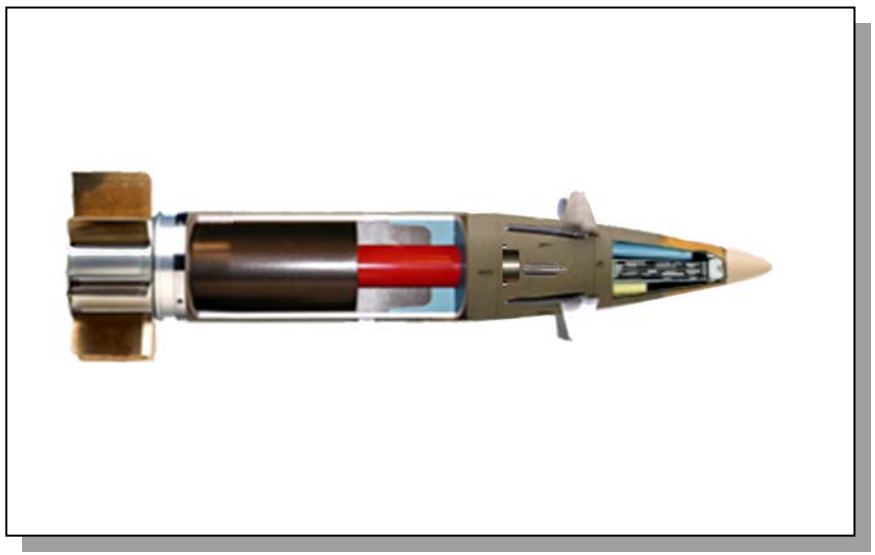
The JM&L LCMC executes integrated Life Cycle Management through a team of dedicated professionals who provide effective, available and affordable munitions for joint warfighters.

Ammo Transformation

Excalibur

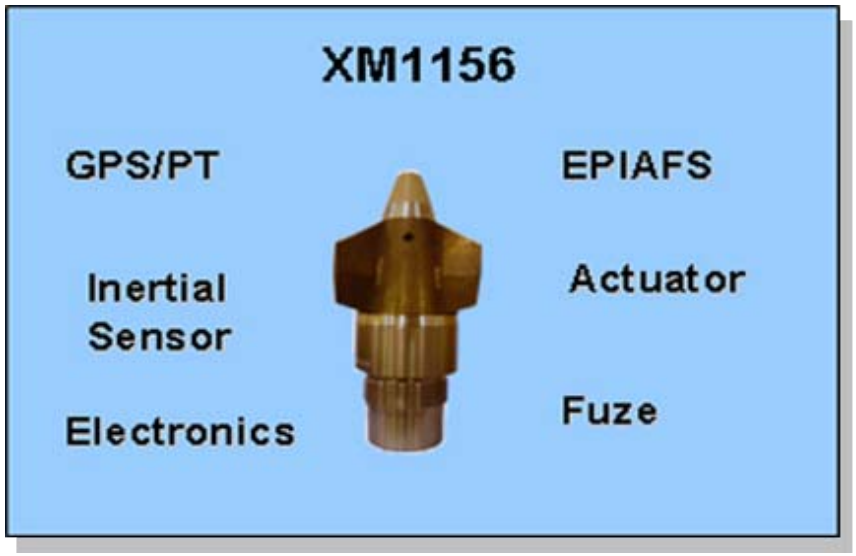


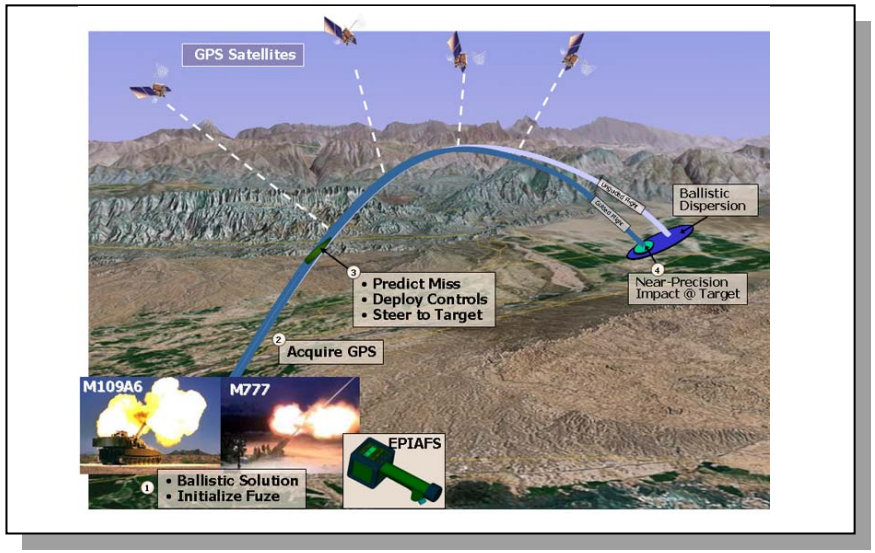


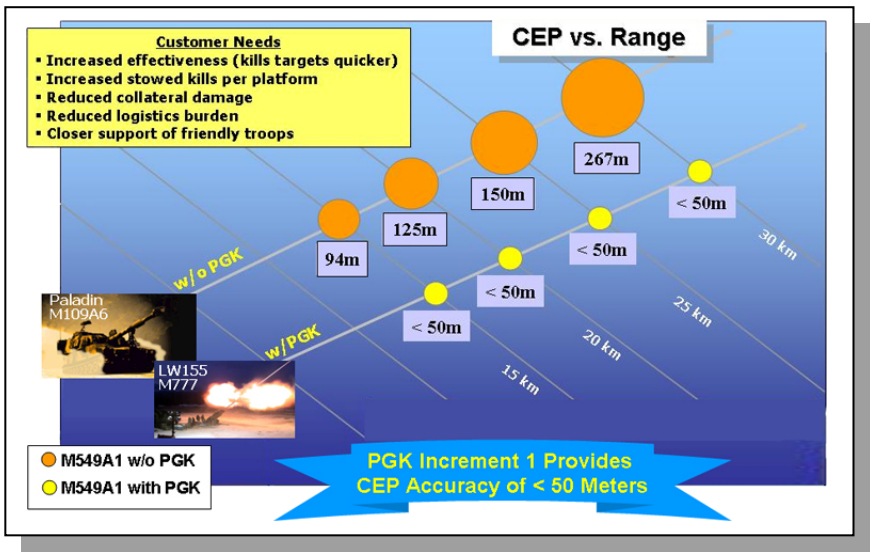



PRODUCT MANAGER
PRECISION STRIKE
XM982
EXCALIBUR
EXCALIBUR XM982
LIMITED USER TEST (LUT)
8-17 FEBRUARY 2007

Precision Guidance Kit

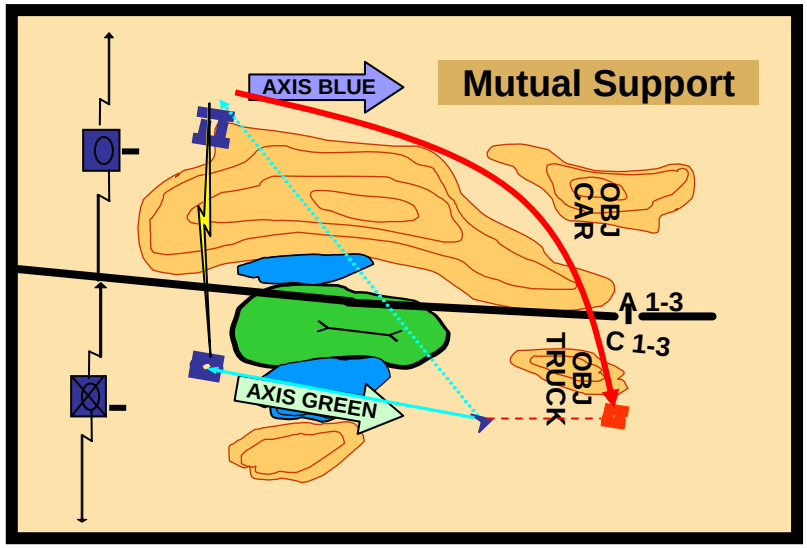






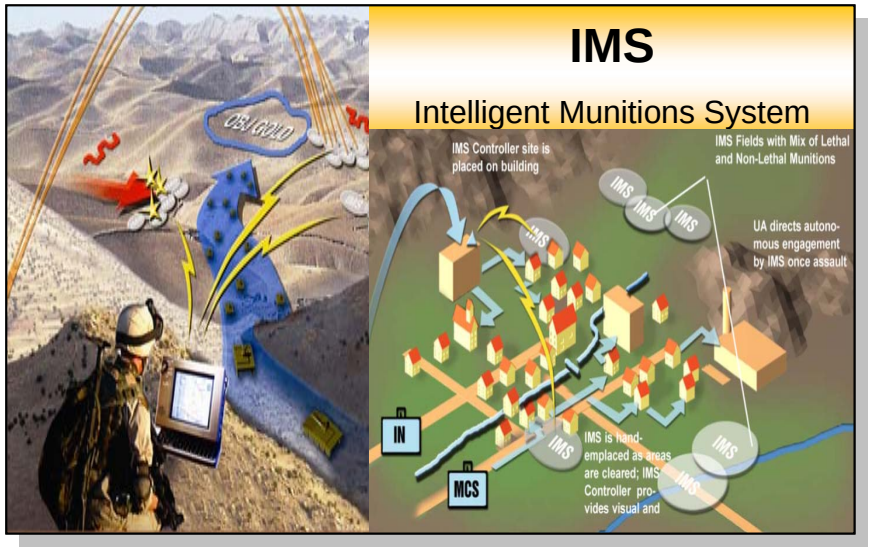
Mid Range Munition

MRM-KE



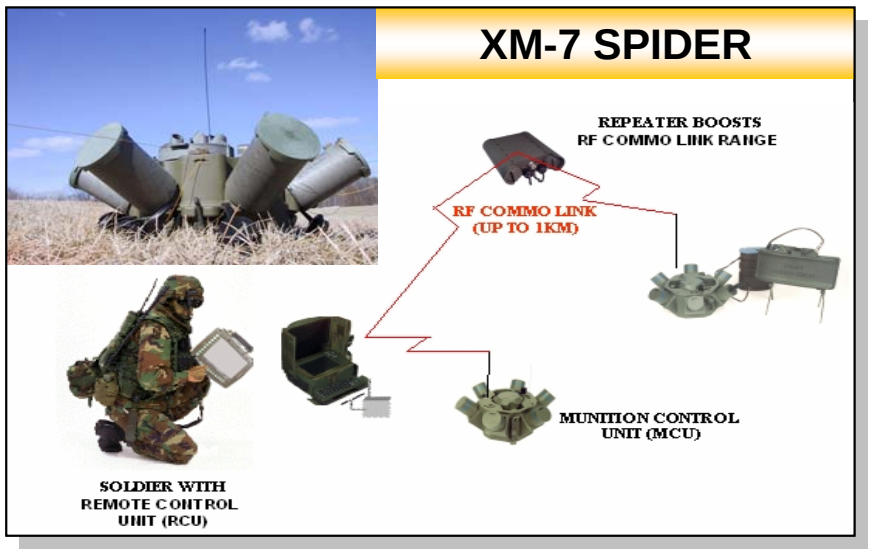
MRM-CE

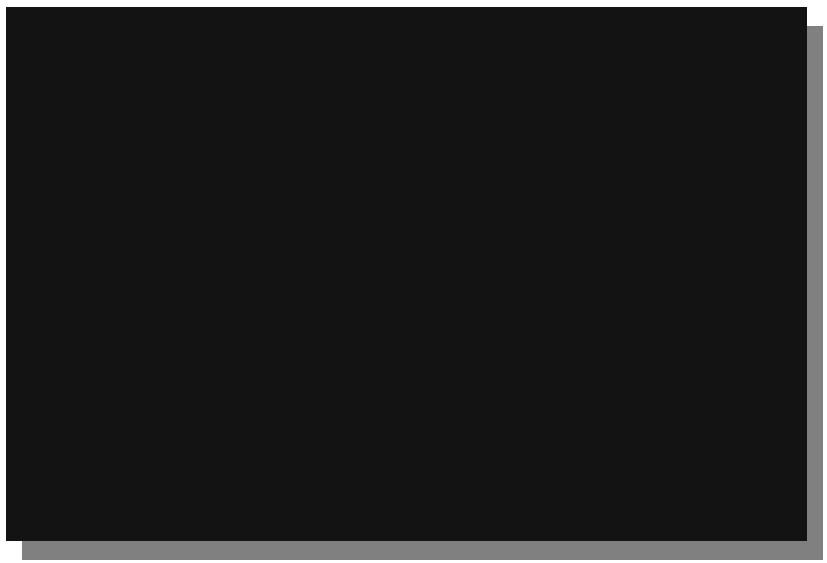
Networked Munitions



Requirements

- Linked to a Networked System
- Shapes the Battlespace
- Protects the Force
- Provides SA & Selective Engagement (Non-Lethal to Lethal)
- Safe passage & recoverable





Lessons Learned

- Your User is Your Best Friend
- Shoot Early—Shoot Often
- Compete – Compete – Compete
- Home on Home
- Diagnostics/Prognostics

Unmanned Systems Roadmap
July 11, 2007

Dyke D. Weatherington
OUSD(AT&L)/PSA/Air Warfare

#07-S-2293

Cleared for Open Publication

UAS Planning Task Force

- Established October 2001 at the direction of Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L))
  - To address the need for an integrated Defense wide initiative for UAS planning and execution
  - Provides oversight on all DoD UA acquisition programs
  - Publications released
    - OSD UAS Roadmap (3 editions)
    - UAV Reliability Study
    - Airspace Integration Plan for Unmanned Aviation

Unmanned Systems Funding
(RDT&E, Procurement, O&M ($M))

UAS	**FY07**	**FY08**	**FY09**	**FY10**	**FY11**	**FY12**	**FY13**	**Total**
RDT&E	$760.8	$814.8	$1,246.7	$1,334.9	$1,181.8	$859.1	$839.5	$7,038
Procurement	$878.4	$1,370.3	$2,025.1	$2,010.5	$1,725.7	$1,750.8	$1,585.7	$11,346
O&M	$590.0	$382.9	$415.4	$479.5	$514.5	$558.2	$610.0	$3,551
								$21,935
UGS								
RDT&E	$198.2	$215.4	$199.8	$167.5	$129.3	$58.5	$20.0	$989
Procurement	$106.5	$39.3	$29.7	$18.3	$17.9	$156.3	$481.5	$849
O&M	$156.0	$5.7	$8.8	$10.3	$11.0	$12.1	$12.7	$217
								$2,055
UMS								
RDT&E	$41.5	$27.7	$44.2	$50.9	$59.6	$68.0	$97.5	$389
Procurement	$0.0	$0.0	$27.6	$28.1	$72.7	$52.8	$51.4	$233
O&M	$0.0	$0.0	$0.0	$0.0	$0.4	$2.1	$3.2	$6
								$628
TOTALS								
RDT&E	$1,000.6	$1,057.9	$1,490.7	$1,553.3	$1,370.7	$985.7	$957.0	$8,416
Procurement	$984.9	$1,409.5	$2,082.4	$2,056.9	$1,816.4	$1,959.9	$2,118.6	$12,429
O&M	$746.1	$388.6	$424.2	$489.8	$525.9	$572.4	$625.9	$3,773
Grand Total	$2,731.5	$2,856.0	$3,997.3	$4,099.9	$3,712.9	$3,518.0	$3,701.5	$24,617.1

UAS Funding
(RDT&E and Procurement)

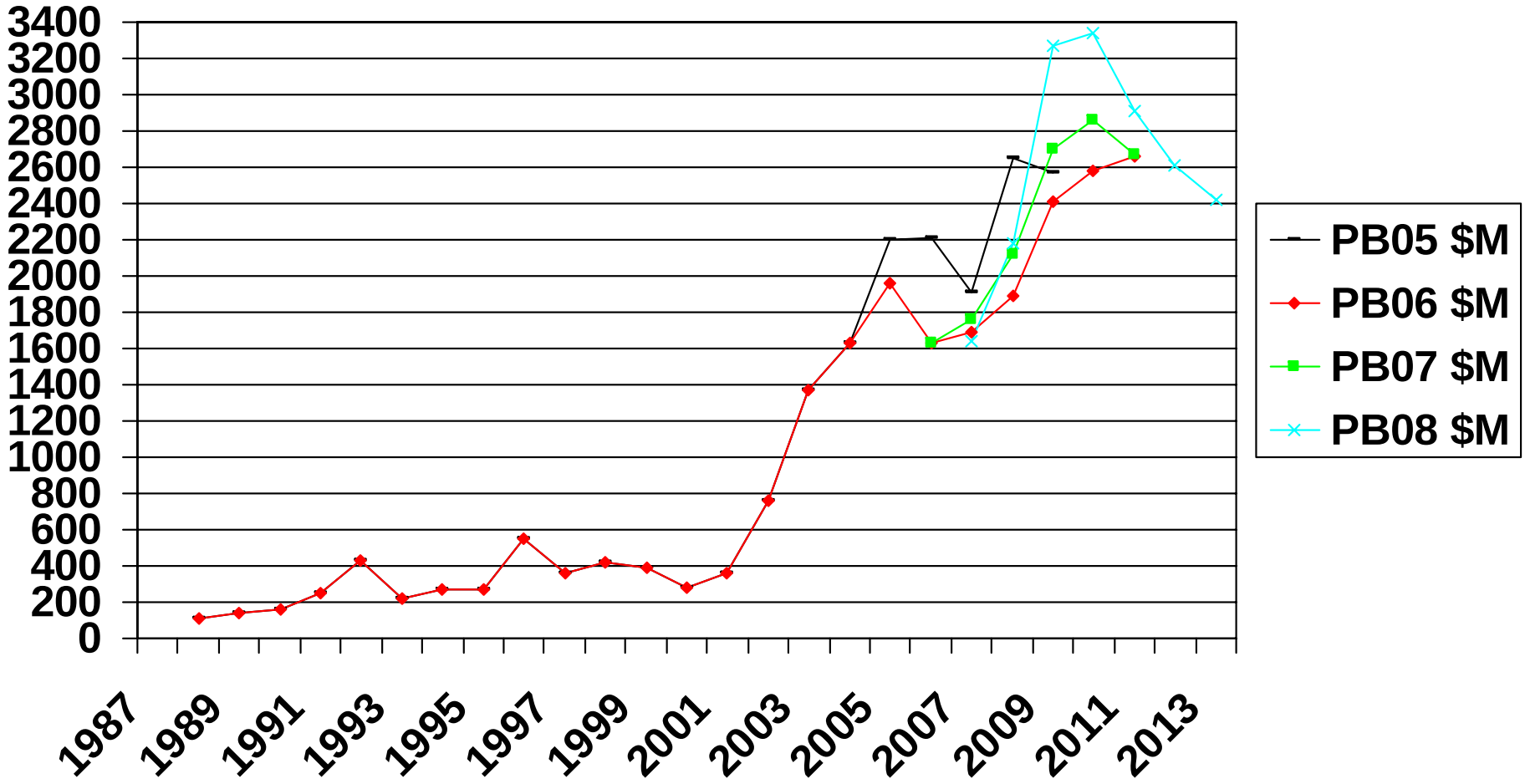
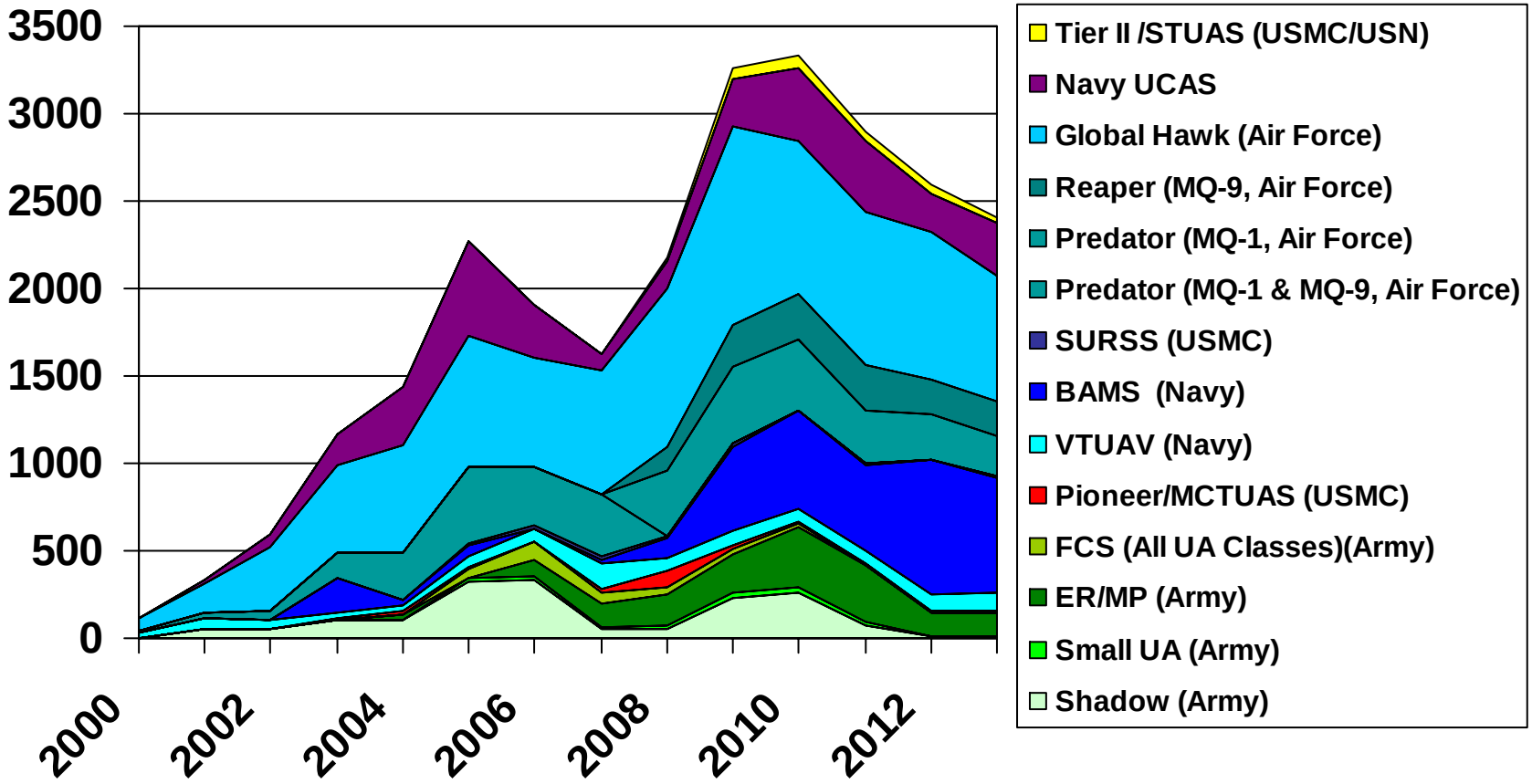


Chart does not include supplement funding

#07-S-2293

PB08 UAS Funding By Program



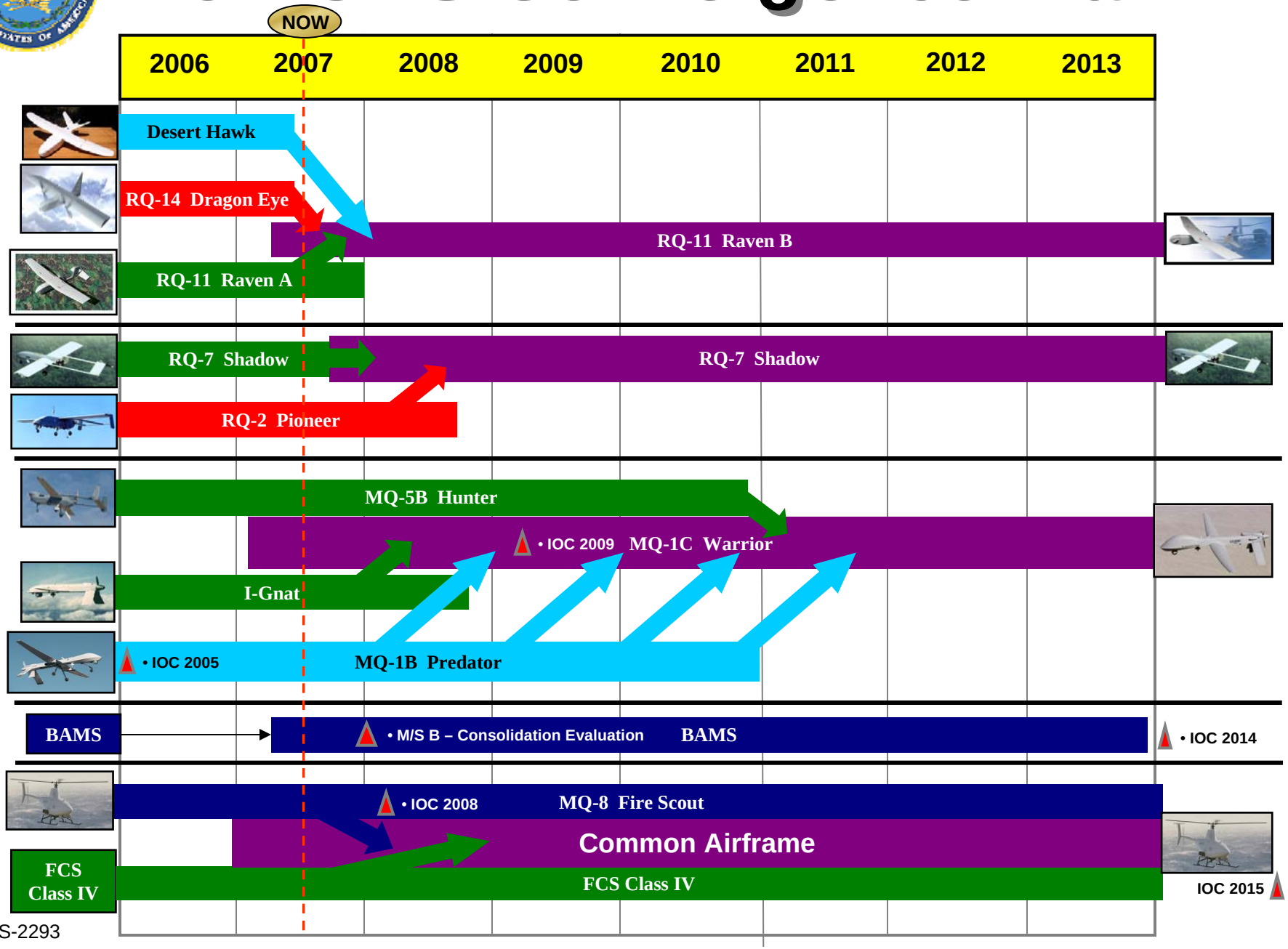
Change in Number of UA (2002 - 2007)

UAS	# of UAS		Change in # (2002 - 2007)
	2002	2007	
Theater & Tactical (> 10 lbs)			
Buster		20	**20**
Pioneer	34	33	**-1**
Shadow 200	24	220	**196**
Neptune		15	**15**
Tern		15	**15**
Mako		14	**14**
Tigershark		9	**9**
SnowGoose		28	**28**
Hunter	41	54	**13**
I-Gnat		9	**9**
Predator	22	90	**68**
Predator B		8	**8**
Global Hawk - ACTD	6	4	**-2**
Global Hawk - Production		7	**7**
GHMD	0	2	**2**
Sub-Total	**127**	**528**	**401**

UAS	# of UAS		Change in # (2002 - 2007)
	2002	2007	
Small (< 10 lbs)			
Aqua Puma		18	**18**
Raven A & B		2469	**2469**
Dragon Eye	40	705	**665**
Desert Hawk		96	**96**
MAV (ACTD)		25	**25**
Swift		124	**124**
Sub-Total	**40**	**3437**	**3397**
Grand Total	**167**	**3965**	**3798**

Note: Small unmanned aircraft systems (SUAS), those weighing less than 10 lbs and being capable of being hand-launched, have been included. The greatest increase in numbers of aircraft is due to SUAS. SUAS are listed separately. Numbers listed are for aircraft, not systems. Systems are composed of varying numbers of aircraft.

DoD UAS Convergence Plan



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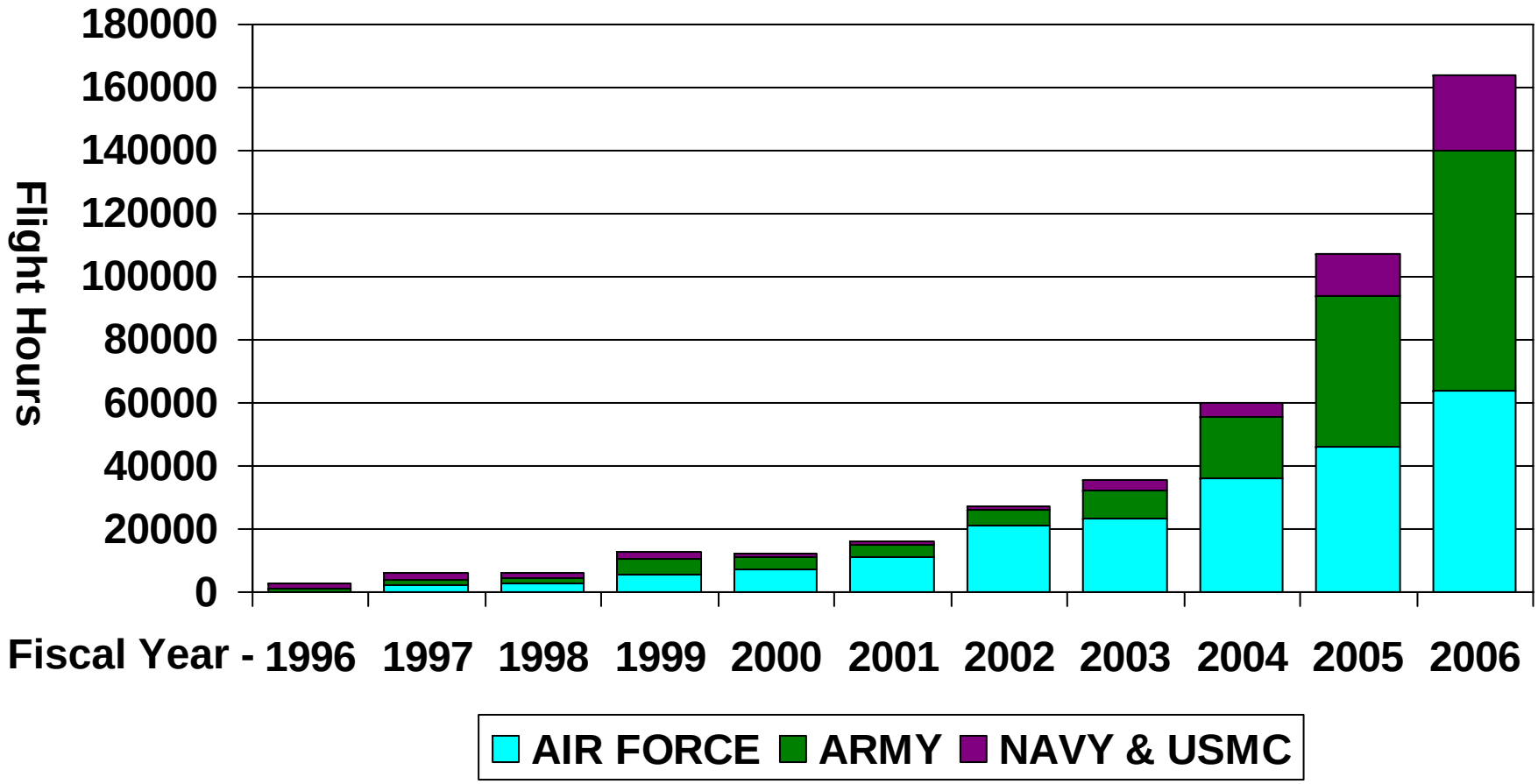
DoD UAS Flight Hours

(Does not include Small UAS)



Unmanned Systems Roadmap

- The Unmanned Systems Roadmap spans 2007-2032 and covers Unmanned Aircraft Systems, Unmanned Ground Systems, and Unmanned Maritime Systems.
- Combines existing information from the Office of Secretary of Defense Unmanned Aircraft Systems (UAS) Roadmap (2005-2030), the 2005 Joint Ground Robotics Master Plan, and the 2004 Unmanned Underwater Vehicle Roadmap.
- The long term plan is to publish a truly integrated *Unmanned Systems Roadmap* in 2009 that will focus on all Service systems, air, ground, and sea; their interoperability and how to achieve our future vision.

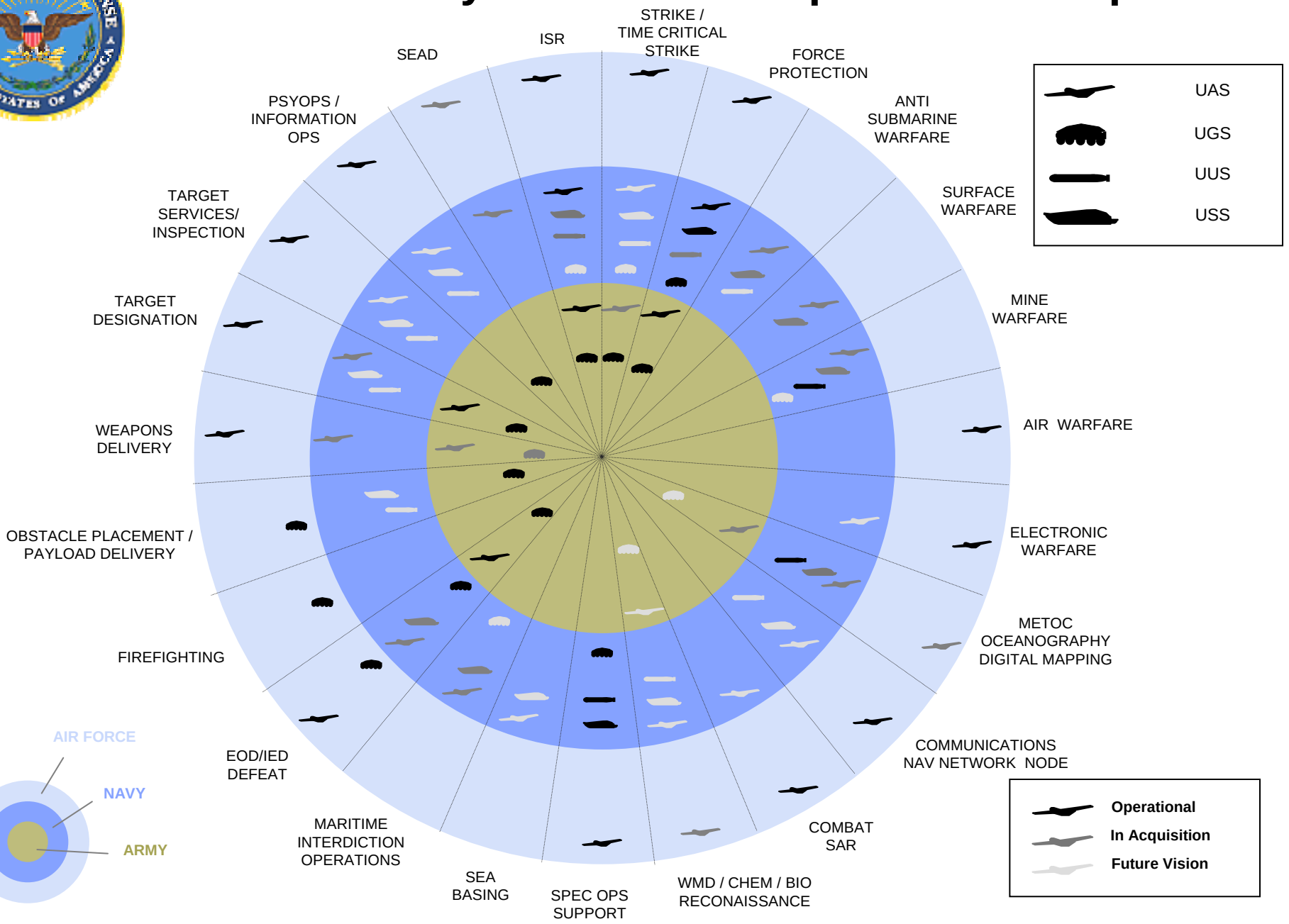
- Planned publish date – 31 Aug 07

OSD Application

- The Unmanned Systems Roadmap is *guidance* for the systematic migration of mission capabilities to Unmanned Systems while addressing the most urgent COCOM mission needs that are supported both technologically and operationally

- The Unmanned Systems Roadmap will *not be a* budgetary document and will *not direct* funding of Unmanned Systems nor related technology
  - But it *is* the document we will use to evaluate how well the services and components have implemented the OSD Unmanned Systems vision …

Unmanned Systems Roadmap Mission Graphic



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Top 7 Aircraft Systems Mission Areas

Mission	Unmanned Aircraft Class			
	Small	Tactical	Theater	Combat
1 - Reconnaissance	1	1	1	1
2 - Precision Target Location and Designation	2	2	2	2
3 - Signals Intel	7	3	3	4
4 - Battle Management	3	4	5	6
5 - Communications/Data Relay	8	6	4	7
6 - Chem/Bio Reconnaissance	5	5	9	8
7 - Combat SAR	4	7	8	9

(Prioritized by mission area across unmanned aircraft class)

Office of the Secretary of Defense
Unmanned Systems Roadmap, 2007-2032

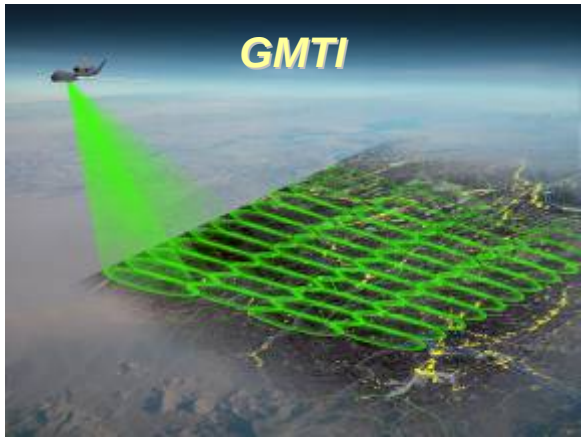
Format

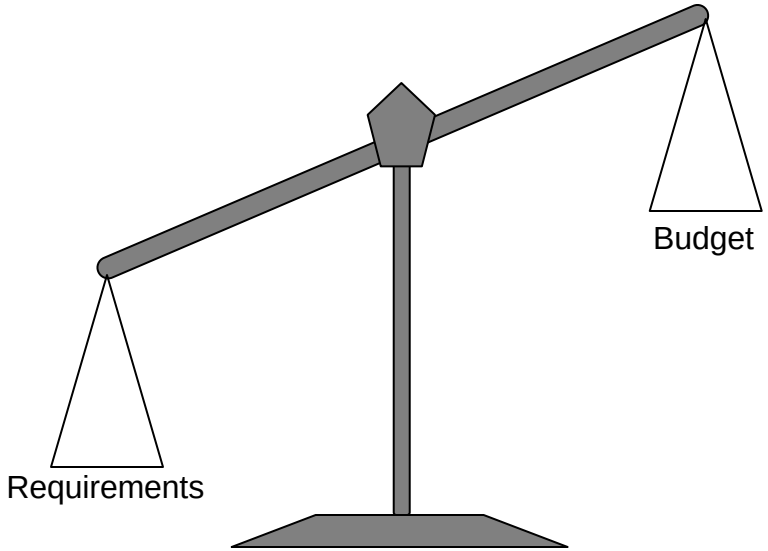
- **Executive Summary**
- **Chapter 1 – Introduction**
- **Chapter 2 – Strategic Planning and Policy**
- **Chapter 3 – Interoperability and Standards**
- **Chapter 4 – COCOM Mission and Capability Needs**
- **Chapter 5 – Organizational Efforts**
- **Chapter 6 – Technologies for Unmanned Systems**
- **Chapter 7 – International Cooperation**

- **Annex A – Unmanned Aircraft Systems**
- **Annex B – Unmanned Ground Systems**
- **Annex C – Unmanned Maritime Systems**
- **Annex D – Unmanned Systems POCs**
- **Annex E – Mission Area Definitions**

Different COCOM Needs

1. CENTCOM – FMV/ SIGINT
2. PACOM - MMTI
3. SOUTHCOM – FOPEN

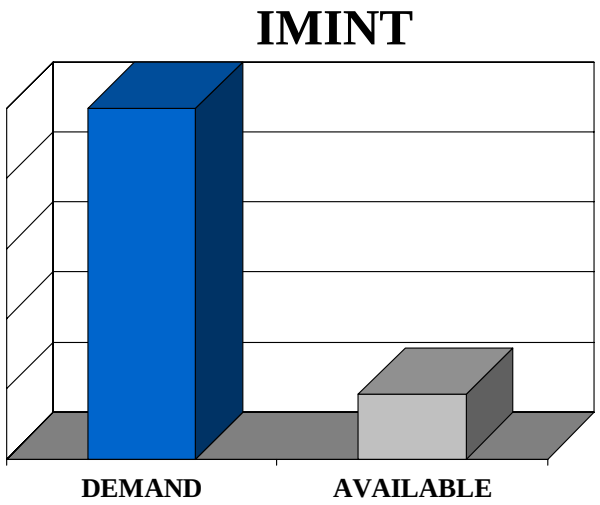


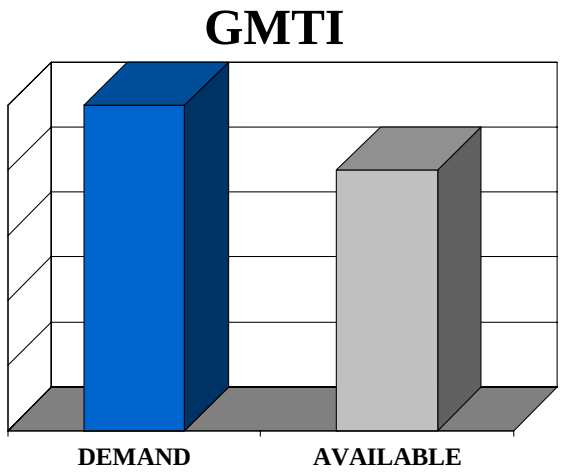


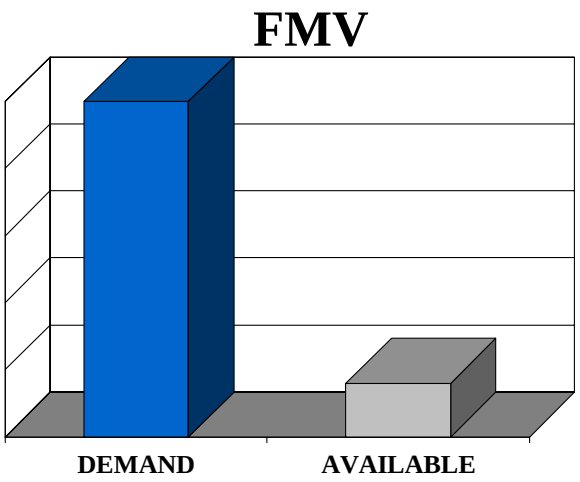
FOPEN Test Bed

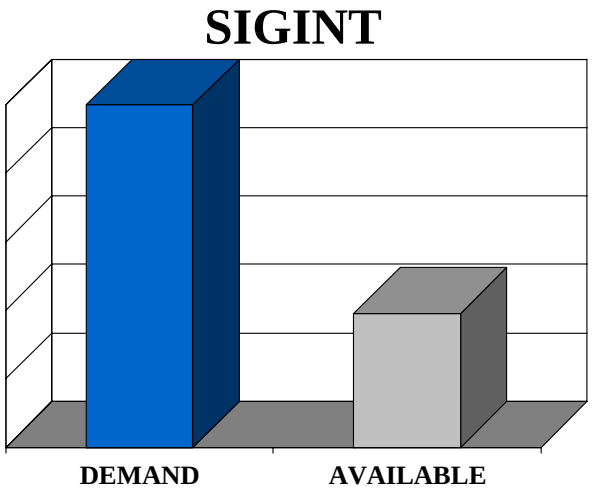
Prioritization differs tremendously between theaters

Global ISR Demand & Supply









UAS Reconnaissance

Full Motion Video (FMV)

- MQ-1B Predator
- RQ-2 Pioneer
- RQ-5 Hunter
- RQ-7 Shadow
- MQ-9 Reaper
- RQ-11 Raven B
- I-GNAT/ Warrior A

UAS Precision Targeting

Metric Sensor

- **MQ - 1B/ MQ – 1C/ MQ-9**
  - **Improved coordinates directly from MTS FMV at the aim point (cross-hair)**
  - **MTS FMV can be directly input to Gridlock, providing improved coordinates for multiple pixels on frame within seconds**
  - **Provides improved coordinates instantaneously for all pixels (precision view)**

Target Location Accuracy Improvement Stages

Mine Detection

Coherent Change Detection (CCD)

- **RQ – 4 Global Hawk is working on solution**

Infrared Surveillance Imagery

- **MQ – 1 Predator**
- **RQ-2 Pioneer**
- **RQ – 4 Global Hawk**
- **RQ-5 Hunter**
- **RQ-7 Shadow**
- **MQ-9 Reaper**
- **RQ-11 Raven B**
- **I-GNAT/ Warrior A**

Signals Intelligence (SIGINT)

Airborne Signals Intelligence Program (ASIP)

- **RQ – 4 Global Hawk Block 30 (FY-12)**

Tactical SIGINT Program (TSP)

- **MQ – 5B Hunter**
  - **Capability was demonstrated**
- **MQ – 8 Fire Scout**

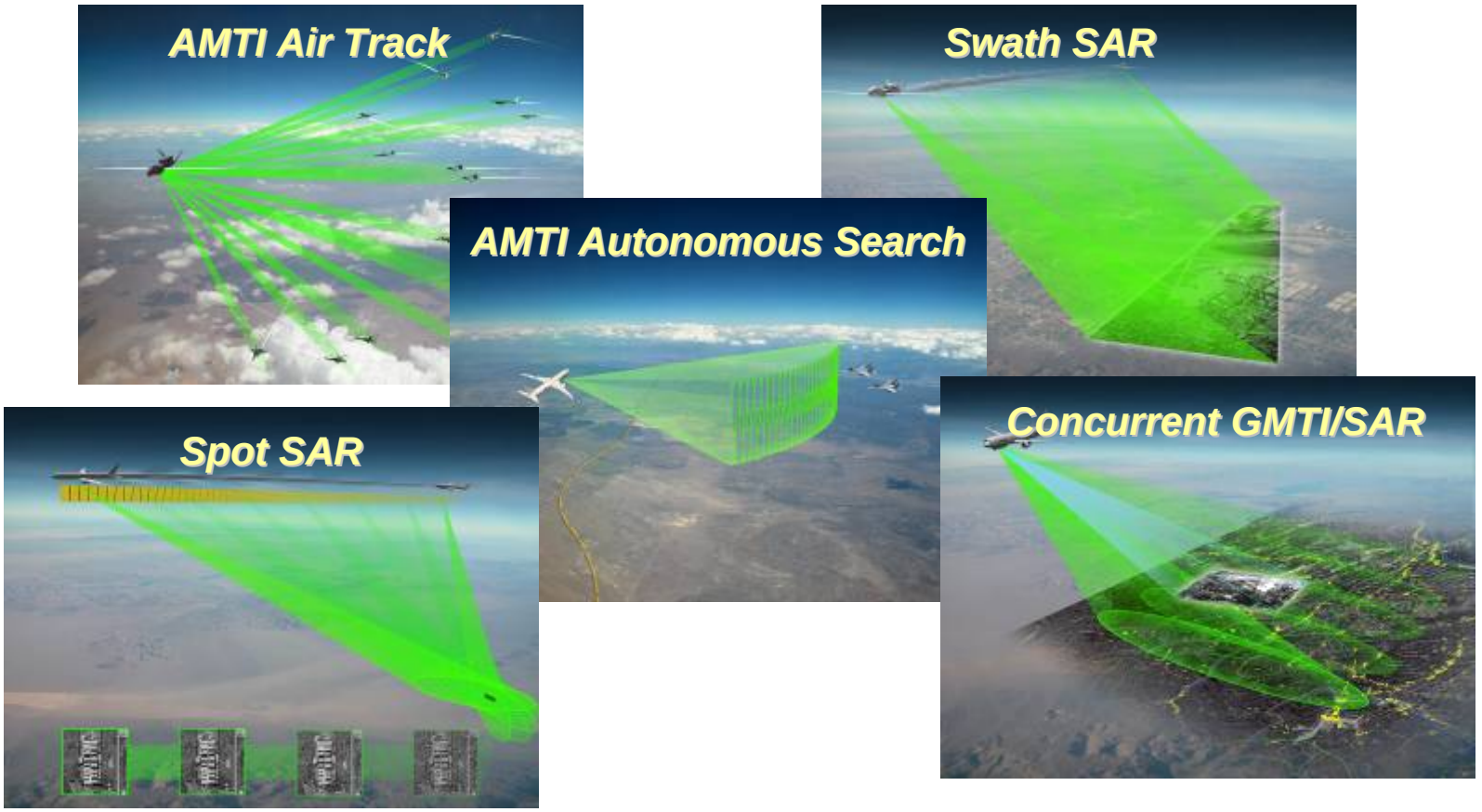
SIGINT solutions being evaluated for fielding

- **MQ – 1B Predator**
- **MQ – 1C Warrior**
- **MQ – 9 Reaper**

Battle Management

Multi Platform – Radar Technology Insertion Program

- **Global Hawk Block 40**



Future Look

- **Communications Relay Packages**
  - **Unmanned and manned platforms**
- **See/Track Laser Spots/designators**
- **Simultaneous spotlight and wide area surveillance (currently one or the other)**
- **Ability to employ multiple EO/IR/RF sensors simultaneously**
- **Ability to employ range of weapons**
  - **UAS cueing of other platforms weapons**


Questions?